INTERDISCIPLINARY RESEARCH STUDIES BRINGING APPLIED SCIENCES INTO FOCUS

István András–Mónika Rajcsányi-Molnár–István Péter Németh (Eds.)

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Auditori salutem

As part of the project Social Renewal Operational Programme 4.2.2 B.2., the College of Dunaújváros aimed at raising the standards of the local system of talent development as well as the work of scientific student groups and colleges for advanced studies. A great deal of success at local, regional and national levels have been achieved both among professors and students, and thus our college has taken big steps towards obtaining the title of university of applied science.

This publication provides an overview of what the College of Dunaújváros represents today, in 2015; from material sciences to engineering or from communication science to a wide range of teacher training fields. The award winning work of the local scientific student groups as well as those of the National Scientific Students' Associations Conference (OTDK) can all be found among the student publications, which bear witness to the devoted work of the mentors and coordinators of the different colleges for advanced studies as well.

Talent development and Scientific Students' Associations (TDK) are both integral parts of Hungarian higher education and also of the life of the College of Dunaújváros. Our institute makes every effort to find the programmes that help our students to graduate successfully and obtain their degrees, and talent development is only one form of it. Other fields gaining more and more importance are the fight against the drop-out of students, helping students to pass their final examinations, offering them mentoring and recognising their possible shortcomings, helping and aiding their professional development, and offering them the opportunity to participate in dual professional training and ensuring they receive actual workplace practice. The programme called Supporting Students' Success (SSS; in Hungarian: Hallgatói Sikerességet Támogató Projekt = HASIT) is closely related to these ideas and tasks, which is connected to our history of Scientific Students' Associations (TDK) activites, but serves more purposes since it would like to train all students to be successful graduates and experts who meet the challenges of the labour market.

The College of Dunaújváros trusts its students, its students' work and believes in the results of the work done, and this publication, which includes the work of our most talented students, proves more than adequately that our students are not mere "Neptun Codes" for us.

Vivat Academia!

(Editors)

GYÖNGYVÉR TÓHÁTI-SÓLYOM *

Role of mentors in talent support through the example of a primary school

Abstract: The objective of my paper is to discuss the role of mentors, specifically the role mentors have in talent support. The field of my research is the primary school, where I teach in the junior years (1–4). Do all teachers have the abilities that enable them to be mentors? What are the qualities that characterise good mentors? What do teachers think of mentorship? Does mentoring have difficulties? How do talented students relate to their mentors, what do they expect of them? How does the mentoring system work in the practices of primary schools? Several questions have emerged, and each could be given lengthy answers. The most interesting is the observation of the way of thinking that characterises teachers in connection with this topic, how open the internal world of schools is to these changes. To what extent teachers are able to renew themselves, learn from one another and integrate the mentor role in their teacher roles. Mentoring has just recently appeared in schools.
Keywords: Mentor, talent support.

Összefoglalás: Dolgozatomban a mentori szerepkör vizsgálatát tűztem ki célul. Azon belül is a mentorok a tehetséggondozásban betöltött szerepét vizsgáltam. Kutatásom színtere az az általános iskola, ahol alsó tagozatban tanítok. Vajon minden pedagógus rendelkezik-e azokkal a képességekkel, melyek képessé teszik a mentori szerepkörre? Milyen tulajdonságok jellemzik a jó mentort? Hogyan gondolkodnak a mentorságról a pedagógusok? Vannak-e a mentorálásnak nehézségei? Hogyan viszonyulnak a tehetséges tanulók mentoraikhoz, mit várnak el tőlük? Hogyan működik a mentori rendszer az általános iskola gyakorlatában? Számtalan kérdés merül fel tehát, melyekre egyenként is hosszasan lehet válaszolni. A legérdekesebb annak a gondolkodásmódnak a megfigyelése, ami a pedagógusokat jellemzi a témával kapcsolatban, az iskola belső világa mennyire nyitott a változásra. Hogyan

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képesek a pedagógusok megújulni, egymástól tanulni, a pedagógus szerepbe beintegrálni a mentori szerepkört. Az iskolákban az utóbbi években jelent meg a mentor fogalma.
Kulcsszavak: Mentor, tehetséggondozás.

Introduction

Professional support for colleagues, providing support for young teachers, sharing experience have all been already known at schools. According to Government Decree 138/1992. (X. 8.), the preparation of trainee teachers was supervised by a professional helper appointed by the employer. Their tasks included the preparation of trainee teachers for the activities of the profession, evaluation of their performance, visits to their lessons, and providing consultation opportunities for them. [1] The legal background was modified over ten years later, and as Government Decree 326/2013. (VIII. 30.) stipulated it, the term professional helper was replaced with the term professional trainer-mentor. Their tasks have been extended to include the preparation of trainee teachers for their qualifying exams. [2]

The introduction of the term mentor also indicates a change in the way how things are viewed. The law provides that the role of mentors is closely related to the teacher role, since the mentors of trainee teachers come from among them. When does a teacher become a mentor? Is professional experience, the knowledge they have gained enough, or do they need more than that? The tasks of a mentor at school are not limited to supporting trainee teachers. On the basis of experience, their activities could be extended to other roles, on one side of which we can find the teacher-mentors, on the other side student teachers, trainee teachers, pupils or perhaps colleagues. These are not new activities at schools, just the older colleagues they could always rely on, who always set an example to younger colleagues by teaching at a high professional level were not called mentors. The teachers who supported talented children and offered them extra lessons, or helped disadvantaged students. There was a decades-long practice of leading the teaching practice of student teachers at schools. However, the changes have started. The question thus is: what roles can mentors have in the everyday lives of primary schools?

[1] Government Decree 138/1992. (X. 8.) on the execution of Act XXXIII of 1992 on the Legal status of civil servants in public education institutions [online] [2015. 03.16.] <http://jogszabalykereso.mhk.hu/cgi_bin/njt_doc.cgi?docid=17020.596108>

[2] Government Decree 326/2013 (VIII. 30.) on the promotion of teachers and the execution of Act XXXIII. of 1992 on the legal status of public servants in schools and all public education institutions. In: *Magyar Közlöny 2013. évi 143. szám* [online][2015.03.16.] <http://www.pdsz.hu/container/files/attachments/36444/kormanyrendelet.

Mentors and Talent Support

The term mentor dates back to Ancient Times. A mentor is a "fatherly friend, protector." It comes from the name of the friend of Ulysses, the Greek Mentor. [3] Its original meaning includes a confidential, supporting relationship between mentors and their pupils. Mentors usually guide some kind of a learning process, and through the use their own knowledge, energy and time, they help their mentored ones to achieve their goals – "they fill a kind of gap." [4] This usually applies to all kinds of supporting relationships which are able to provide support by imparting knowledge and experience such as counsellors, social helpers etc.

The activities of a mentor may be different in the world of education, depending on who the mentoring is aimed at:
– A mentor supports the teaching practice of college students at school, guides their ways of gathering experience, analyses and assesses their work and helps their development.
– The mentor is the one who helps career-starter teachers to gather professional experience.
– The mentor supports disadvantaged students or those with special educational needs. [5]

The mentoring systems of colleges and universities are also being developed: support for students, and the professors as tutors. It has been in the last few years when the training of mentor teachers leading the teaching practices has become of outstanding importance, since it is their job at their schools to lead the semester-long continuous practice of student teachers. The introduction of this type of training was necessitated by the fact that it had to be ensured that the level of the training practices at schools of teaching practice are at the same high level. [6] Mentors have an important role at schools since surveys show that teaching competences develop during the college years and the three years following them. The mentoring system is able to achieve results in the development of teacher competences. [7]

The teacher-pupil mentor system is an important scene of supporting pupils. Individually tailored methods, direct teaching of pupils lead to better results in the cases of both disadvantaged and highly talented pupils. Who do we call talented? How can we recognise talents?

[3] Juhász József (Szerk.) (1987): *Magyar értelmező kéziszótár. M-ZS.* Budapest: Akadémia. Edition 7. P. 945.

[4] Mlinarics József –Juhász Ágnes (2008): *Mentorálás-mentorság.* [electronic document] [16.03.2015.] Pp. 6–7. <http://www.taninfo.hu/tanulmanyok/mentoralas.doc>

[5] Di Blasio Barbara–Paku Áron–Marton Melinda (2013): *A mentor, mint kapuőr a tanári professzió kialakításában.* [online] [16. 03. 2015.] <http://www.oktatas.hu/kozneveles/projektek/tamop_315_pedkepzes_fejl/projekhirek/t315_mentor_mint_

[6] Szegál Borisz–Kelemen Gyula (2011): *Mentorképzés-Tananyag.* Dunaújváros: Dunaújvárosi Főiskola Kiadó Hivatala. P. 20. P. 5.

[7] Suplicz Sándor (2011): *Tanárok mentorálásának elméleti alapjai.* Budapest: DSGI Kiadó. P. 10.

Act CXC of 2011 on public education stipulates the support of pupils needing more attention as a general requirement. They include pupils with special educational needs, pupils with integration, learning, behavioural difficulties and pupils of outstanding talent as well. One of the prime objectives of the law is to prevent failure to achieve and support talented pupils. Talent is defined as follows: "children, pupils who require special treatment are of outstanding talent if they have above average general or specific abilities, a high degree of creativity, and possess strong motivation for and commitment to the tasks." [8] Sometimes talented children have abilities at different levels, in such cases their weaker abilities also have to be developed. "Underachievement is when school results, or the results achieved in a special field are significantly lower than they could be expected on the basis of the level of the abilities." [9] Providing a definition of talent is of outstanding importance since the first step of talent support programmes is to identify talents, and this is certainly not a simple job.

Presentation of the Objectives, Background, Methods of Research; Hypotheses

The objective of my research is to obtain a more accurate picture of the term mentor at primary school, specifically their role in talent support. I have examined teachers' attitude to the mentor role. The legal background stipulates the practice of mentoring college students and trainee teachers. However, there are fields such as helping colleagues, talented pupils or those in disadvantaged situations, where the support from a mentor may also be necessary. Talent support provides an opportunity to develop a mentor-pupil relationship. Since there have been ongoing talent programmes at schools for years, I will emphasise this field when further examining the role of mentors.

My research cannot be termed representative since its location is one of the primary schools of a county seat, where I myself teach in the junior years. The school is located in the town centre. The school has 770 pupils. 398 of them study in the first four years, and 372 of them in years 5–8. We have special English and German courses from the first year on, and years 1–4 have ÉKP (Zsolnai- féle Értékközvetítő és Képességfejlesztő Program – Zsolnai Value Transmitting and Ability Development Programme).

[8] Act CXCof 2011 on Public education [electronic document] [28. 03. 2015.]<http://net.jogtar.hu/jr/gen/hjegy_doc.cgi?docid=A1100190.TV>

[9] Gefferth Éva (Szerk.) (2014): *Mentorálás a tehetséggondozásban.* MATEHETSZ. P. 24. [electronic book] [25. 03. 2015.].<http://tehetseg.hu/konyv/mentoralas-tehetseggondozasban>

We were among the first ones in the town to gradually introduce competence-based education starting in 2006. The research used questionnaire surveys and interviewing techniques. I prepared two questionnaires, one for teachers, and another for pupils currently participating in a talent support programme. Sixty per cent of the staff filled in the questionnaire (36 people). Ninety per cent (9 people) of the study circle of underachieving talents, and 75% (6 people) of the science study group participated in the survey. I conducted an interview with the head of the talent development programme, who is the head teacher of our school, and two teachers who participate in the talent support programmes as mentor teachers and lead talent support teachers.

When formulating the hypotheses, my ambition was to interpret the role of mentors as broadly as possible. I took both my experience as a teacher and the special literature into account. This is how I selected the fields to be examined. My suppositions:

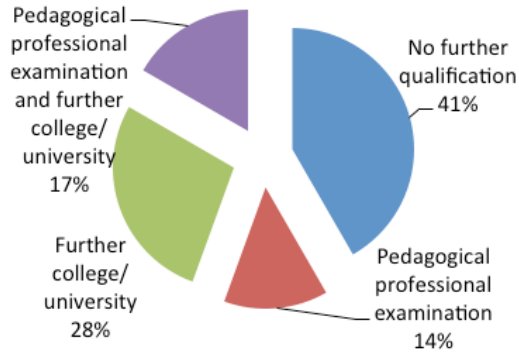
– Several types of mentoring systems operate at the school, which my colleagues have a great deal of experience for.
– My hypothesis is that the more professional experience teacher have, the more likely they are to undertake a mentoring role.
– Teachers with less professional experience would use a mentor's help.
– Teachers and pupils express the same expectations of mentor teachers.
– The development of a mentor relationship between a teacher and a pupil may have a positive effect on the development of talents.

Research Results

Characteristics of Teachers and Pupil Groups

Ninety-two per cent of responding teachers are women. Their breakdown by age is: 16.6% belong to the age group 25–35, and 55.5% are aged 36-50. Their average age is 44 years. The age of the teachers is closely related to the length of their professional experience. Fifty-six per cent of respondents teach in the junior years, 36% in the second four years. Older age is typically accompanied by longer professional experience. These teachers have an average of 20 years of professional experience. The teachers of our school place great emphasis on training sessions (*Chart 1*).

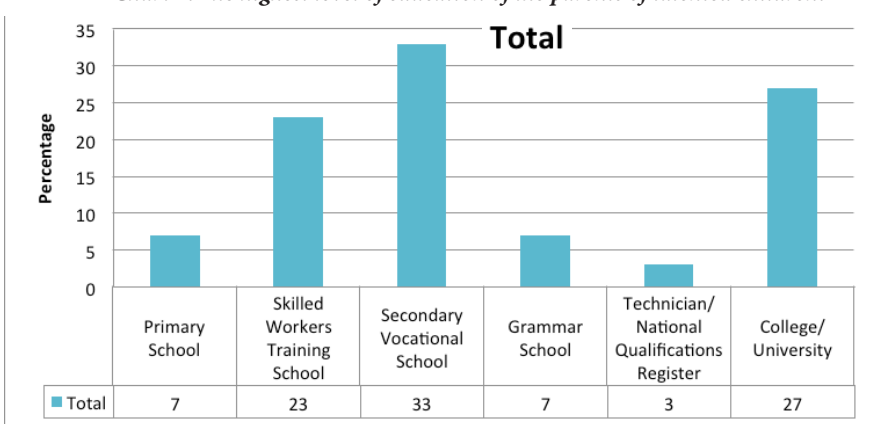
Chart 1. Teachers' Further Qualifications.



In addition to the statutory training sessions every seven years, they participate in further college, university and pedagogical professional examinations. Fifty-nine per cent of the teachers have further degrees.

Of the pupils, 50% of those who have a talent for sciences are girls. 66.6% of underachieving talents are girls. The interviewed pupils are aged 11–14, and are in years six and seven. When the level of education of their parents is examined, we can see that at least 70% have a GCSE/high school diploma, and 27% are college or university graduates (*Chart 2*). The mothers' highest level of education in the case of pupils with a talent for sciences is at least a GCSE/high school diploma or a college/university degree.

Chart 2. The highest level of education of the parents of talented children.

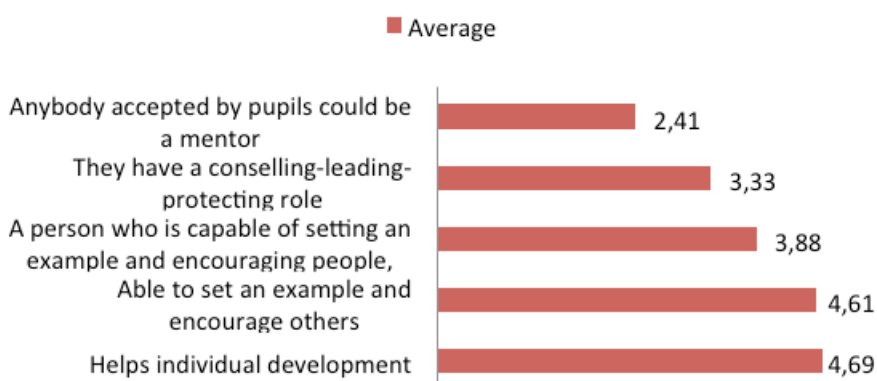


The academic results of pupils with a talent for sciences are outstanding. Thirty-three per cent of under-achieving talents are A-level, 67% of them B-level students. The members of both groups have participated in the talent support programme for not more than two years.

The Mentor Role As Seen by Teachers

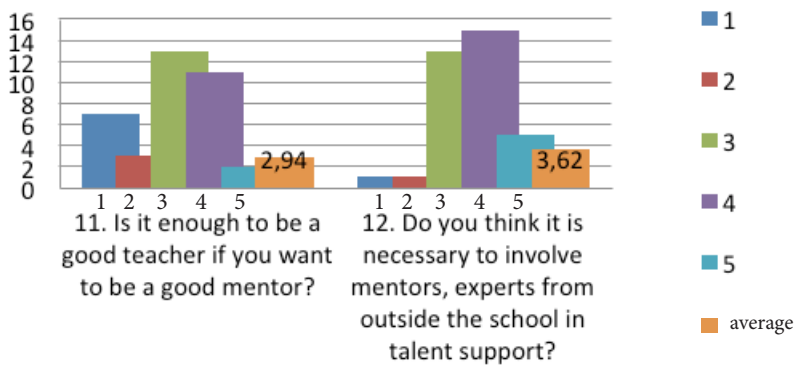
One of the objectives of the research is to explore teachers' way of thinking about the mentor role. The teachers gave their opinions about statements on mentors (*Chart 3*). 2.8% totally agree with the statement that anybody could become a mentor, 16% mostly agree, 20% reject it (the average is 2.41 points). According to 30.6% of the teachers, mentors fulfil both counselling-leading and protecting roles (the average is 3.33 points), 30.6% totally, 36% mostly agree that mentors are able to make an impact (an average of 3.88 points). According to 72% of the teachers, mentors are able to set an example and encourage (average of 4.61 points), and 75% think they help individual development (average of 4.69 points). This means that teachers generally consider mentors a person who helps the development of individuals and is able to set an example and encourage. According to a majority of respondents, mentors are capable of making an impression on individuals and groups. Hardly half of teachers agree with mentors' counselling-leading-protecting role. The least supported interpretation, which states that anybody could become a mentor, suggests that teachers consider mentoring a role that not everybody is capable of fulfilling.

Chart 3. Interpretations of the mentor's role based on average points given to answers.



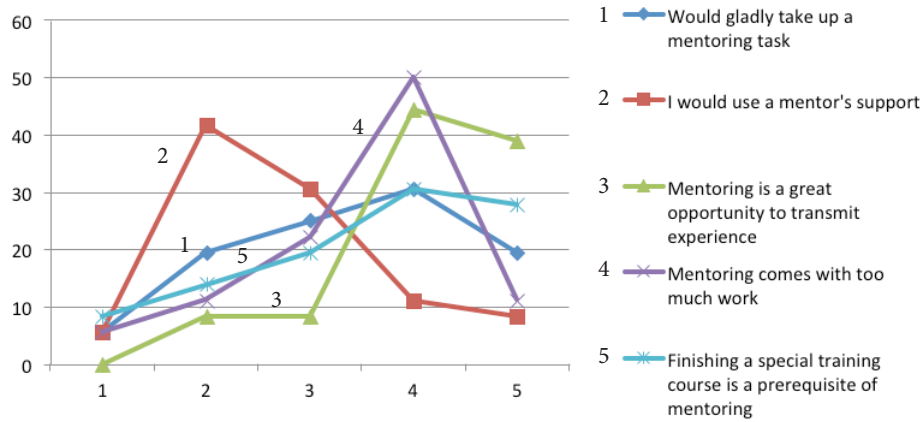
The connection between the mentor and teacher roles is very close, yet there are differences. (*Chart 4*) Are good teachers good mentors as well, or are there certain differences between the two roles? Six per cent (2 people) of the teachers completely agreed with the statement that good teachers are good mentors, while 19% (7 people) totally disagreed. The average of the answers was 2.94 points, that is, over half of the teachers identify themselves with this opinion.

Chart 4. The mentor and teacher roles.



It has become a regular practice to involve an expert from outside the school in talent support in the science study circle. In such cases the outside expert is not necessarily a teacher, which means, the role of the mentor may be separate from the role of the teacher. The respondents rather agree with the inclusion of expert mentors in talent support: 13.8% totally, 41.6% mostly support this option (an average of 3.62). The teachers consider the mentor job an excellent opportunity to transmit experience, 38.9% totally, 30.6% mostly agree, and nobody rejects it (*Chart 5*).

Chart 5. Mentoring Attitude.

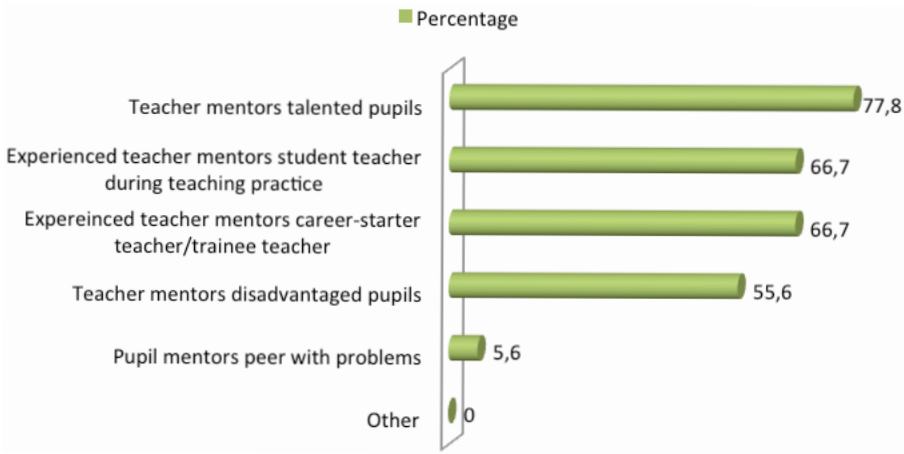


This means that the attitude to mentoring is basically positive. The opinion that special (mentor) training is necessary for mentoring had bigger support. 27.8% of the respondents totally, 30.6% mostly agree with it, and only 8.3% reject it totally. This reflects the opinion that a teacher cannot necessarily work as a mentor. An important part of the opinions about a mentor's job is to what extent it can be fitted into a teacher's role, how much extra work it requires. 11.1% of the respondents totally agree with the statement that a mentor's role comes with too much work, while 30.6% mostly agree. At the same time, 19.4% of the teachers would surely, 30.6% would mostly undertake a mentoring task. However, fewer of them would use a mentor's help. This is rejected by 8.3%, and 41.7% only agree to a lesser extent.

Comparison of Results to the Hypotheses

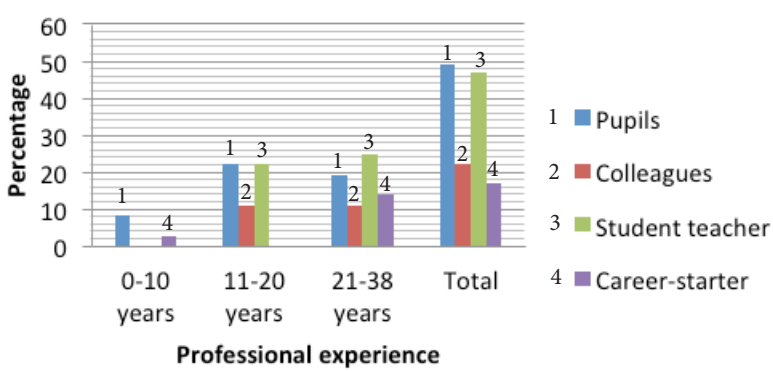
According to the first hypothesis, several types of mentoring systems function at the school, which my colleagues have a great deal of experience for. The teachers are aware of all of the mentored areas (*Chart 6*). The highest number, 77.8%, indicated the mentoring of talented pupils, which makes it the best known in the school. 66.7% are aware that student teachers and career-starter teachers are mentored at the school. 55.6% of the respondents mentioned the mentoring of disadvantaged pupils. Finally, only 5.6% of the teachers think that mentoring pupils has an established practice. The figures do not come as a surprise considering that talent support is paid outstanding attention at the school.

Chart 6. Mentor systems at the school.



Seventy-eight per cent of the teachers have some experience as a mentor. Most of them have mentored pupils and student teachers. Those with more extensive professional experience have mentored career-starter teachers and colleagues as well (*Chart 7*).

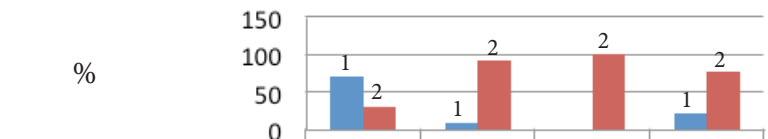
Chart 7. Breakdown of teachers' mentoring and professional experience.



The data seem to justify the first assumption, namely the practice of mentoring has been known and used at the school, and the teachers have a great deal of experience in all the mentoring fields.

According to my second hypothesis, the longer professional experience teachers have, the more likely they are to undertake a mentoring role. Only 30% of teachers with 0–10 years of professional experience have done some mentoring job already (*Chart 8*).

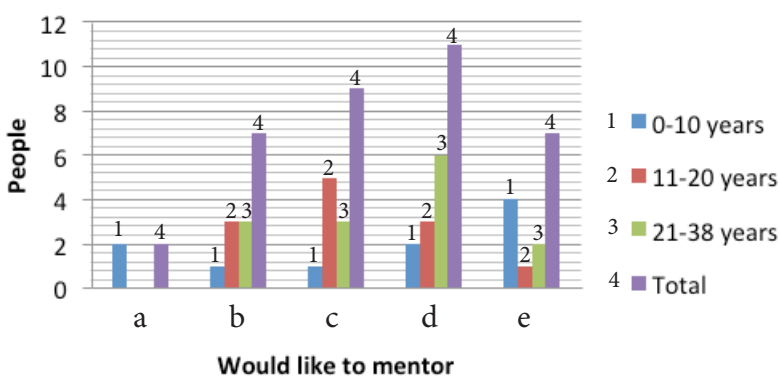
Chart 8. Professional experience and mentoring practice.



		0-10 years	11-20 years	21-38 years	Total
1	No mentoring done	70	8,3	0	22
2	Have done mentoring	30	91,7	100	78

91.7% of those with 11–20 years of teaching experience have done some mentoring work in some field. Finally, 100% of teachers with the longest professional experience have some mentoring experience. The number of those with no mentoring experience decreases with the number of professional years. The inclination to mentor is the highest among those with 0–10 years of professional experience (60 %), at the same time, those who reject it most also come from among them (20%) (*Chart 9*). Fifty-seven per cent of those with 21–38 years of professional experience would gladly undertake mentoring. The majority of those with 11–20 years of experience do not reject it, but do not seek mentoring tasks either.

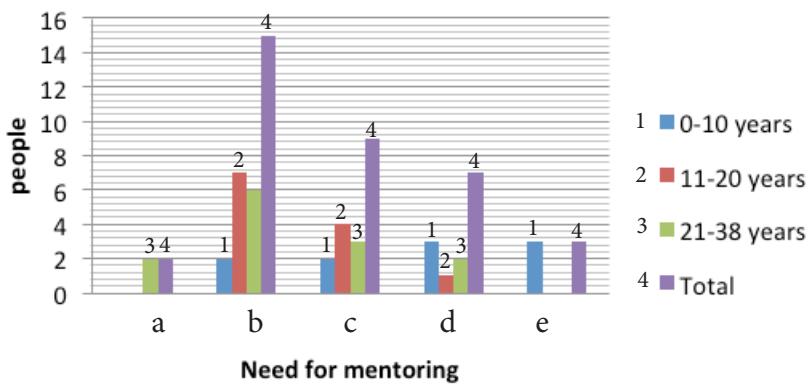
Chart 9. Professional experience and inclination to mentor.



All these indicate that whether one undertakes a mentoring task or not does not depend on the length of professional experience. Those with less experience would also willingly become mentors.

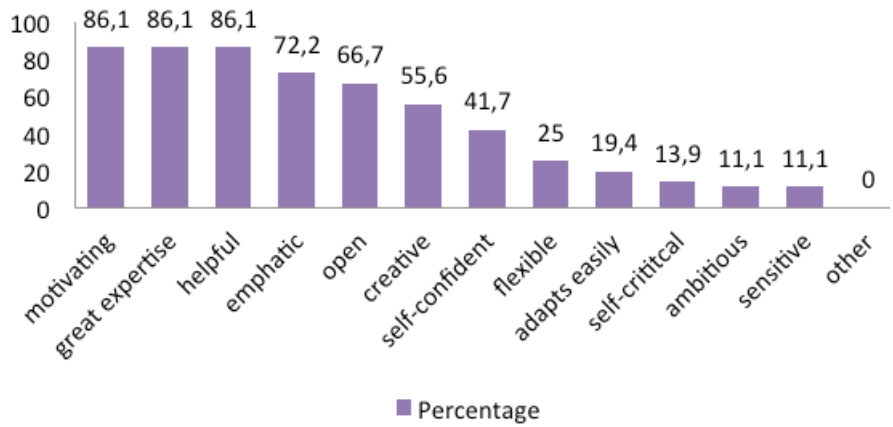
On the basis of my third hypothesis I expected that teachers with less professional experience would readily use the mentoring help of a more experienced colleague. (*Chart 10*). Most, 60%, of those with 0–10 years of professional experience would definitely or mostly require mentoring help. The ones rejecting it most are teachers with 21–38 years of experience, and those with 11–20 years of experience, 57% and 58% respectively. All this was to be expected since more professional experience makes one more self-confident. What is surprising is the fact that there were still teachers who, although they have more professional experience, yet they would require support from a mentor. This means that there are challenges during a teacher's career where a mentor may offer support.

Chart 10. Professional experience and the need for mentoring.



According to the fourth hypothesis, teachers and pupils see the qualities of a good mentor teacher similarly. The personality of the mentor may be decisive during the mentoring practice (*Chart 11*).

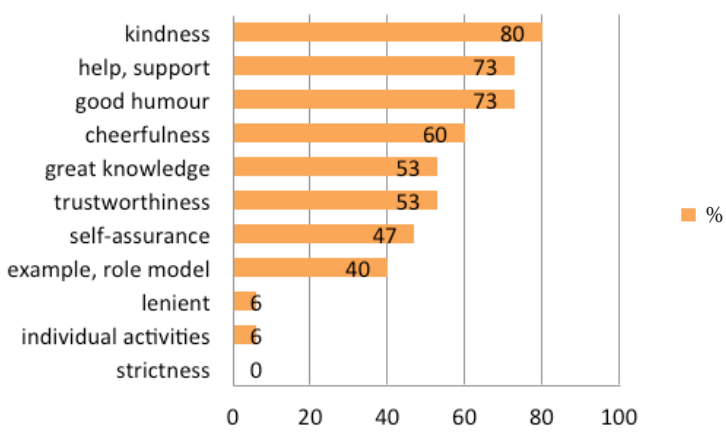
Chart 11. Qualities typical of a mentor according to teachers.



The most important qualities mentioned by the teachers: motivating (86.1%), great expertise (86.1%), helpful (86.1%), empathic (72.2%), open (66.7%), creative (55.6%), self-confident (41.7%)

According to pupils: kindness (80%), help, support (73%), good humour (73%), cheerfulness (60%), great knowledge (53%), trustworthiness (53%), self-assurance (47%), be an example, role model (40%) (*Chart 12*).

Chart 12. Pupils' expectations of a talent supporting teacher.

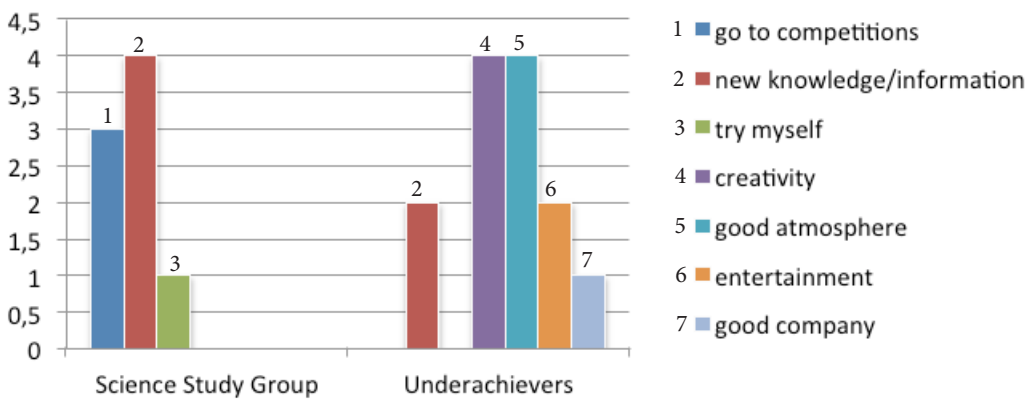


Pupils rather expect emotional support of a mentor/teacher, this is supported by the prominent position of the qualities kindness, humour, cheerfulness. The mentor's knowledge is mentioned only after them. Among the expectations mentioned by teachers, motivation, helpfulness and empathy have outstanding roles, at the same time, great professional knowledge was mentioned as one of the most important ones. When pupils' and teachers' expectations are compared, it can be seen that similar expectations were mentioned on both sides.

According to the last hypothesis, the mentor, who helps the development of talents as a teacher or an expert, has an outstanding role. The interviews showed that the teachers dealing with talented schoolchildren identify themselves as mentors. The leader of the underachievers' study circle emphasised the support of learning, while the leader of the science study group thinks a mentor is more than that.

Pupils with a talent for sciences emphasised gaining new knowledge and the preparation for competitions in connection with the work in the talent development study circle. Creativity and the good atmosphere are the most important to underachievers. Their activities develop their talents in a complex way (chess, information science, drama, all this with historical background, group work) (*Chart 13*).

Chart 13. Talented schoolchildren's expectations of study circle activities.



The most important question is what role a mentor plays in talent support. Has the mentor-pupil connection really been developed? What extras can the mentor role add to the development of pupils' talents? I think a mentor's support may have significant motivational power for talented pupils. Talents should not always be sought among pupils with the highest academic achievements. 33.3% of underachieving talents were A-level students at the end of the first semester. Their complex development is important because the special abilities that determine their talent have not been identified yet, or if they have, there are areas that

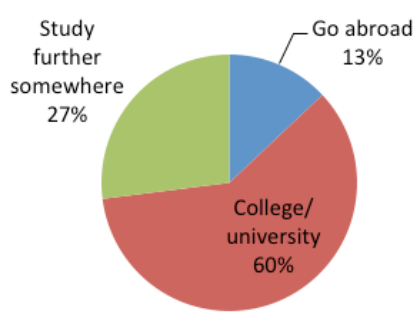
need to be developed. The differences between the talent support study circles originate from the type of talent the pupils have.

In the case of the science study circle, the special field of talent clearly manifests itself. The study circle itself was created with the purpose of ensuring that competitive opportunities even further motivate talented pupils to develop their skills. The activities done in the study circle are also connected. During the interview, the leader of the study circle claimed that the mentoring role has brought her a lot closer to the children, who achieved outstanding results at competitions. However, she thinks the ideal situation is when only a few pupils are mentored. She mentioned full support, assistance and sharing knowledge as the essence of the mentoring relationship.

Increased group sizes make it more difficult to develop the mentor-pupil relationship. Another problem was mentioned by the leader of the underachieving study circle. The talent supporting mentor role comes with big tasks, a lot of work, which schools with a general curriculum cannot always prepare for. Teachers' actual and emotional load is very high. In addition to the increased number of lessons, substitutions, the obligation to spend the weekly work time in the school building, teachers still have to fulfil the tasks they had before. With workload like this, they have to be very committed to undertake a mentoring role.

The colleague working with the underachieving talents also identified herself as a mentor, however, mentioned only studying and ability development as a mentor's role. She has managed to achieve the most important thing, the pupils feel good in the study circle, and with the general development of their competences, their special talents are expected to become stronger and stand out. It is the schoolchildren's future prospects that show best how important a mentor's support is. The children have become committed to learning (Chart 14). Sixty per cent of the children already know they would like to continue their studies at a college or university. The facts that they have been chosen and receive support from their mentor teachers have definitely helped stop their talents from being lost. Their parental background is an equally important factor in this process.

Chart 14. Future prospects of talented pupils.



Thus it can be established that the development of mentor-pupil relationships in talent support provide a lot of opportunities, which, under ideal circumstances (few schoolchildren, mentor teachers who support talents, schools that support talents etc.), splendidly support the development of talents. I think my suppositions have proved to be true.

Summary on the Basis of the Results

Who is a mentor in teachers' eyes? How do they relate to the mentoring systems? What do they think about mentoring? What talent support programmes are there at primary schools? What is a mentor's role in them? A multitude of questions to which I sought answers using the special literature and my own educational experience. Since I conducted my survey at a primary school, the research is not representative. However, the results I have obtained are useful. The school's staff is made up of highly qualified, open, innovative teachers. They have considerable experience in mentoring. The areas to be developed could be pupils' support for each other, the introduction of peer mentors, and especially the support of disadvantaged pupils.

The most important lesson is that mentors are needed, and this is confirmed by opinions both from teachers and pupils. Mentoring is a responsible task, which teachers are generally glad to undertake, but they are aware of the difficulties as well. They are mostly motivated by the fact that they can transmit the knowledge they have gained during the years to their pupils, student teachers, career-starter teachers and even to colleagues. They are also aware of the fact that mentoring requires a lot of work. They find it feasible that experts from outside also work as mentors in order to make talent support even more colourful. They see the differences between the teacher and mentor roles. They think in some cases training is necessary to fulfil a mentor's role. Teachers and pupils have similar opinions about the personality of a mentor teacher, but it is worth paying attention to humour and cheerfulness that pupils have emphasised. Mentors may have a key role in talent support since talents have to be discovered and then helped to develop, especially if their immediate environment is not supportive enough.

EMESE BOGLÁRKA MOCANASU *

Introduction of Operators' Modular Traning System, Development of Service Quality along the Zero Defect Philosophy at Infineon Technologies Cegléd Ltd.

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Abstract: The objective of this article is to describe the correlation between human resources and quality at Infineon Technologies Cegléd Ltd. based on the methodology of their current training. Adapting to the constantly changing environmental conditions poses a serious problem to organisations, which have to live up to their commitments in an increasingly competitive situation. When compared to knowledge of quality, the strength of TQM as a management technique lies in the fact that it tries to use human and material resources the most effective way possible, thus creating value for customers. Human resources, the individuals performing the work have outstanding importance among the resources. In our case it is the most valuable resource as well since it is indispensable in manufacturing processes. They create new value and no other resource can be created without them. It is a well-known fact that added value is created by knowledge-based work. It is possible to achieve it through training that employees meet the present and future requirements of the organisation at a high level. When they possess the skills and abilities, the labour force can easily and effectively perform their tasks in the course of which they fulfil their roles in the value creating process, however, it is indispensable to develop an excellent training system for it.
Keywords: TQM, competitiveness, value creation, people, Yield, Zero Defect.

Összefoglalás: Az cikk megírásának célja bemutatni az emberi erőforrás és a minőség korrelációját az Infineon Technologies Cegléd Kft. jelenlegi oktatási módszertanából kiindulva. A folyamatosan változó környezeti feltételekhez való alkalmazkodás komoly gondot jelent a szervezetek számára, akiknek egyre növekvő mértékű versenyben kell helytállniuk. Minőségügyi ismeretekkel összefüggésbe hozva, a TQM, mint vezetési módszer ereje is abban rejlik, hogy igykeszik a leghatékonyabb módon felhasználni az emberi és anyagi erőforrásokat, így teremtve értéket a vevő számára. Az erőforrások

közül kiemelt fontosságú az emberi erőforrás, a tevékenységet végző egyén. Esetünkben a legértékesebb erőforrás is egyben, hiszen nélkülözhetetlen a gyártási folyamatokban. Ő teremt új értéket és nélküle a többi erőforrás sem jöhet létre. Köztudott, hogy hozzáadott értéket a tudáson alapuló munkavégzés hoz létre. Képzés által elérhető, hogy a munkavállalók magas szinten megfeleljenek a szervezet jelenlegi és jövőbeni követelményeinek. A készségek és képességek birtokában a munkaerő könnyen és hatékonyan végezheti feladatát, melynek során betölti szerepét az értékteremtő folyamatban, viszont ehhez elengedhetetlen a kiváló képzési rendszer megteremtése.

Kulcsszavak: TQM, versenyképesség, értékteremtés, ember, Yield, Zero Defect.

[1]: Economist Intelligence Unit Humans and Machines study sponsored by Ricoh: http://hvg.hu/

Introduction

Considering the economic situation, as well as the results of a survey conducted by Ricoh, it can be seen that the managers of European companies are more concerned about meeting the requirements of technological development than their Asian or North American counterparts. Forty-five per cent of European managers are worried that they cannot keep pace with development, thus they might lose their competitive edge. At the same time, the same proportion in the case of Asian managers is 35%, while it is 37% in North America.

One thing is sure: changes are inevitable. The work methods taken for granted will probably not work for much longer. At the same time, global experts think that workplaces where decisions are made almost exclusively by computers and robots will not happen in the near future. The future holds great potential for people in that they can utilise their resources and thus create value. [1] In order to have satisfied employees in production, in addition to fulfilling customers' requirements by following the zero defect principle, it is necessary to change the training system first.

Professional Abstract

Scientific Background to Topic

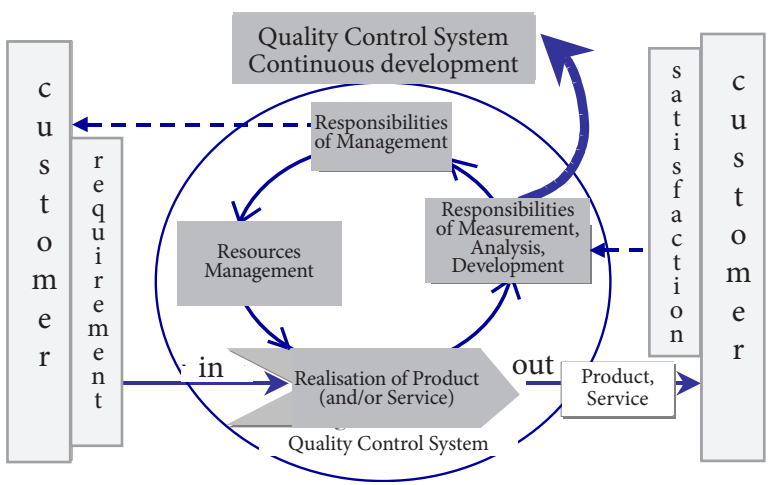
A research is become scientific when it is accompanied by expert knowledge, background in professional literature and results obtained and evaluated through analytical methods. It is important to mention the Zero Defect approach developed by Philip B. Crosby in

connection with the topic, which states that the sources of errors can be eliminated or their number can be reduced through proper training and involvement of the workforce. [2]

[2]: I. Mojzes (2000): *A minőségbiztosítás alapelemei.* [online]

Quality is also based on the fact whether workers really understand what is expected of them, and what the reason for this expectation is. In order to understand the vision and strategy of the organisation, it is necessary to organise ad-hoc and regular training sessions, an instrument of which is the Training Room opened in 2013, where the critical stages of production can be found and new employees practice on non-live batches, where the leading technician helps them learn the technology as their instructor. These training sessions ensure that we are on the same page as regards the knowledge and skills needed for continuous development and improvement.

Chart 1. Process Model of Quality Control.



Source: Own Compilation on the basis of CEKon: Quality Control Systems. [Online], 2015.

Process models may present the closed-cycle process element connections. In Chapter Five entitled "Responsibilities of Top Management" the top management

defines the requirements. The management determines and ensures the resources necessary for it in accordance with Chapter Six on "Resource Management." It may be ensured through the proper management of resources that the processes producing the products and/or services are created, introduced, applied and managed on the basis of Chapter Seven on "Product (and/or service) Realisation." [3]

[3]: CEKon (2003): *Minőségirányítási rendszerek*. [Online]

[4] Lindner Sándor–Dihen Lajosné–Henkey István: *Humán Controlling*. Budapest: Szókratész Külgazdasági Akadémia.

Companies

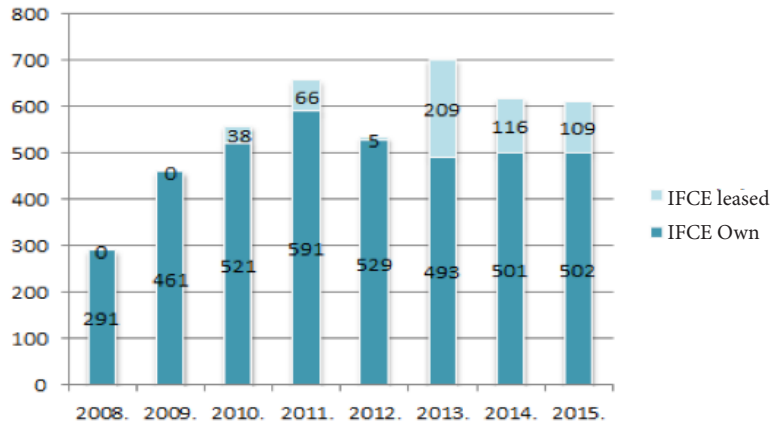
Infineon Technologies Cegléd Ltd.

Infineon Technologies Cegléd Ltd. is the biggest semiconductor manufacturer in Hungary. Infineon offers semiconductor system solutions keeping three central requirements of a modern society in mind – energy efficiency, mobility and safety. It employs nearly 35,000 workers worldwide, 600 of whom currently work at the Cegléd site. Twenty-eight per cent of the workforce do R+D activities, which proves their intention to produce innovative products.

Key to Quality: The Individual

The social-economic transformations, the struggle for survival on the market pose a great challenge to companies. Human resource management gains more and more ground even in the planning phase. This theory was suggested by Dr. Sándor Lindner in his book on Human Controlling. [4] In connection with it, I examined the present operator staff with view to leased and own staff in the first stage of my research.

Graph 1. Proportions of Own and Leased Staff at IFCE.



Source: Own Compilation on the Basis of HR Data, 2015.

It can be seen that the proportion of leased staff has increased in recent years. The reason for it is the growth of the big companies entering the region and the appearance of new companies. As a result, companies need to involve external firms in recruitment and interviewing. The section examined is production, that is, the production line where I work. In order to have data to support the research, I closely examined the production line from every aspect. The production is uniformly a pull system, which means the individual process stages control the speed of the next steps. They make every effort to minimise the buffer, and they work with one product at a time in the different areas. This manufacturing method is called one piece flow. Operators are trained by the lead technician which ensures that properly trained staff produces excellent quality products.

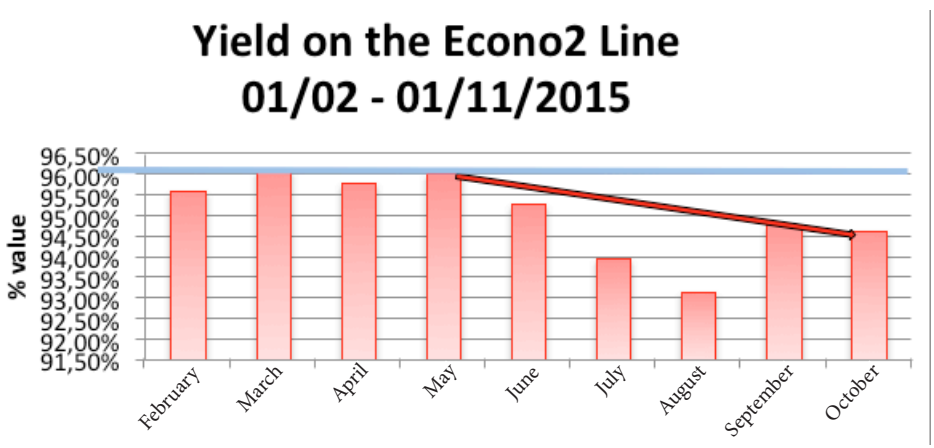
This view is defined in Section 6 of the ISO 9001:2008 standard as well, where resources management is described. [5]

[5]: Hungarian Standards Institution (2005): *MSZ EN ISO 9000:2005.* Budapest: MSZT.

Wage Supplement as a Tool of Motivation

People can be motivated with different tools, which may include sanctions, a rise in salary, appreciation, feedback from management or even regulation of wage supplements within the company. However, all these are driven by people. In our case the bonus system, that is, KPI (Key Process Indicator), achievement of target key indicators influences the wage supplement to be paid at the end of the month. Operators do their best to achieve the targets. A maximum of 25% can be achieved, the basic requirement for which is the achievement of the monthly target number, then Yield, type approval and the number of modules customers complained about (DPM - Defect Per Million). People control the manufacturing process, operate the machines, thus it mostly depends on them if the monthly targets are achieved. The second phase of the research focused on the yield of the production line.

Graph 2. Yield on Econo2 Production Line.



Source: Own Compilation on the basis of Eway4 Data, 2015.

The target value set by the company is 96.3%, however, the values of the line show a decreasing trend. The exact place of the problem needs to be determined in the process of problem solving.

Quality Consciousness in Production

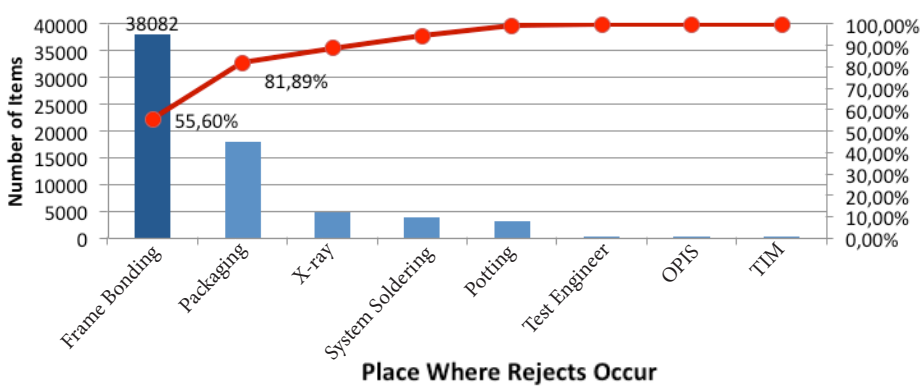
Successful companies have two characteristics: value of management and its quality. The quality of management includes the performance of management tasks related to customer values, operating costs, the use of all the resources and the development of corporate culture resulting in better performance. The value of management includes the use of all the resources of the company in order to achieve growth and profit along TQM. These two aspects are totally related to the quality-centred view of the company. [6] It is the task and responsibility of the PGL (Production Group Leader), who is also a quality leader in their own field, to develop and strengthen quality consciousness in workers. Thus it is necessary to accurately determine and solve problems in order to fully meet customers' requirements and maintain corporate culture.

[6]: Sandholm, L. (2015): Van-e szerepe a jövőben a minőségügyi menedzsernek? *Minőség és Megbízhatóság.* 3–4. P. 134.

Cause and Effect

The place of origin can be clearly determined from the number of rejects in production using a Pareto Graph.

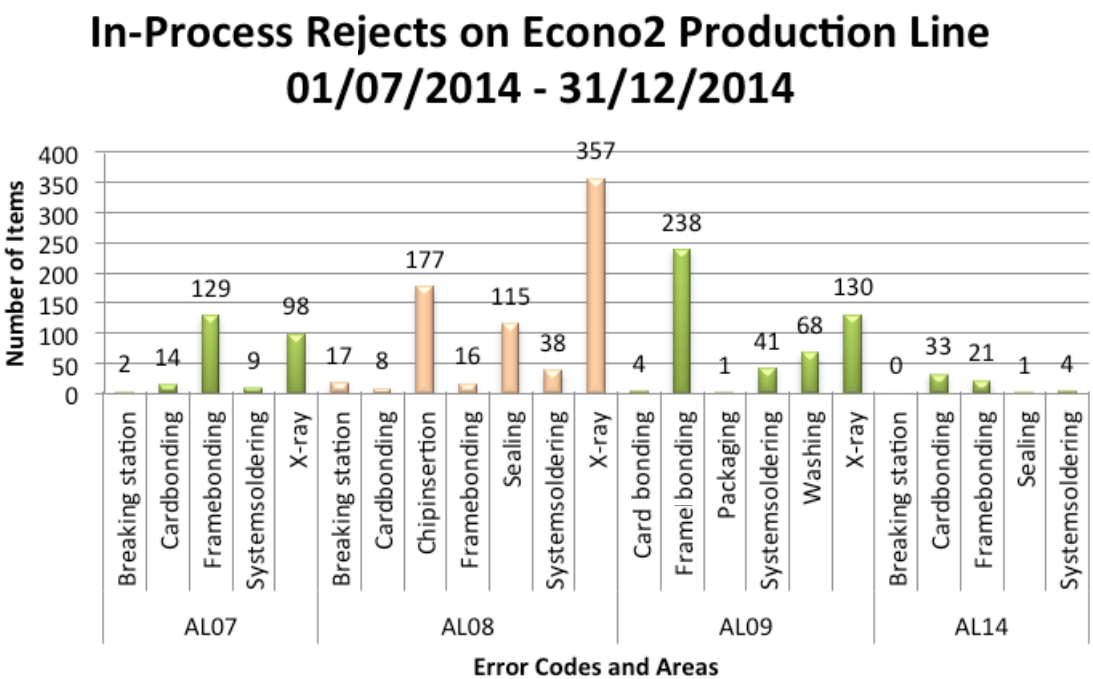
Graph 3. Pareto Graph According to Place of Origin of Rejects, 01/02/2015–01/11/2015.



Source: Own Compilation on the basis of Eway4 Data, 2015.

It can be seen that the framebonding area has the highest number of rejects, that is, 55.60% of module-level rejects occur in the above mentioned area, which causes significant losses to the company. The next element to be examined is the number of in-process rejects focusing on human and mechanical errors.

Graph 4. In-process Rejects on Econo2 Production Line.

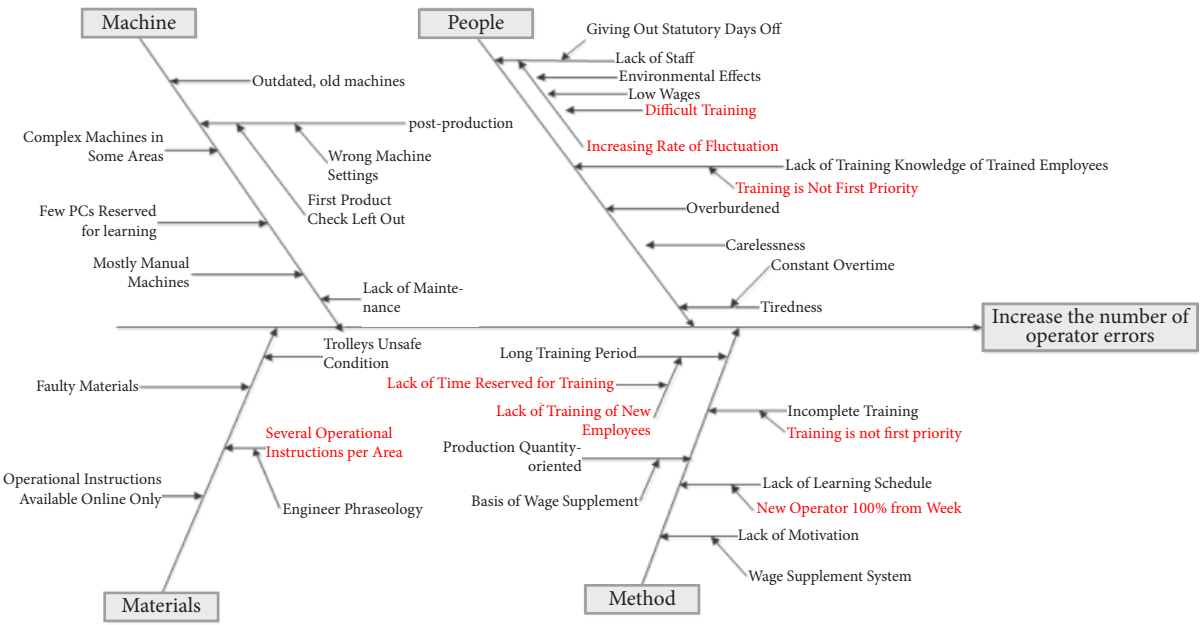


Source: Own Compilation on the basis of Eway4 Data, 2015.

The dark green colour signifies the rejects that may be attributed to human error, in whose case the highest recorded number is at frame bonding. The number of rejects recorded in the X-ray section is mostly traced back to the rejects from the system soldering station, which, when quantified, means 213 modules in the case of AL09 (handling error). The conclusion that can be drawn is that the areas frame bonding and vadu work with critical number of rejects, of which frame bonding is the area which is critical on the basis of several analyses, so I will examine its improvement further. Based on these data, I used the

problem solving tool created by Ishikawa to search for the root cause. Using it, I tried to explore the reasons and find the root cause of human errors and find a solution in the frame bonding area of the Econo2 line that improves yield in order to achieve the target values of the wage settlement.

Chart 2. Ishikawa Analysis: of the Increase in Operator Errors.

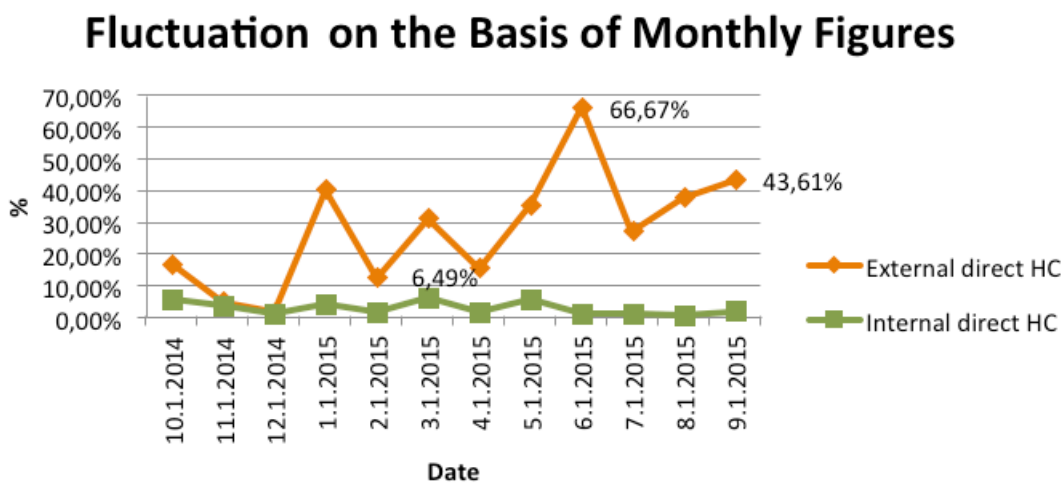


Source: Own Compilation, 2015.

The increase in the number of rejects resulting from operator errors can be traced back to the lack of training, the number of present operational instructions, duration of training and the difficult learning process.

Examination of External and Internal Factors

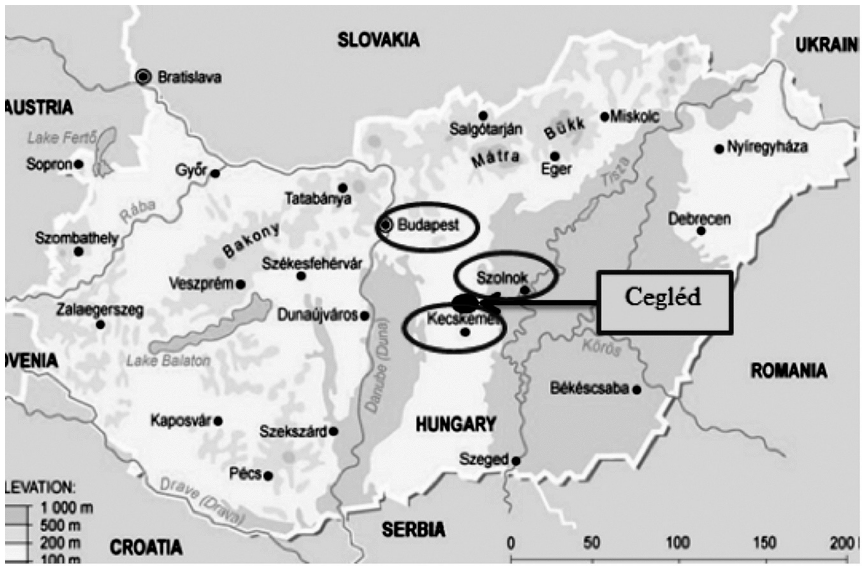
Graph 5. Change of Rate of Fluctuation per Employee in Production.



Source: Own Compilation on the basis of HR Data, 2015.

The increase in the rate of fluctuation can be led back to the fact that new employees are not able to process the operational instructions used in training, they have no time to acquire, learn them although they have to be examined after three month of learning. The last period shows a strengthening in the German line, Bosch, Audi and Opel nationwide, and Mercedes, Knorr-Bremse, Samsung regionally. It is important to note that the Mercedes factory has a great effect on the supplier group as well, not only on the draining of human resources.

Chart 3. Cegléd within Hungary, and the Catchment Area of Cities.



Source: Own Compilation on the basis of Wikipedia Data, 2015.

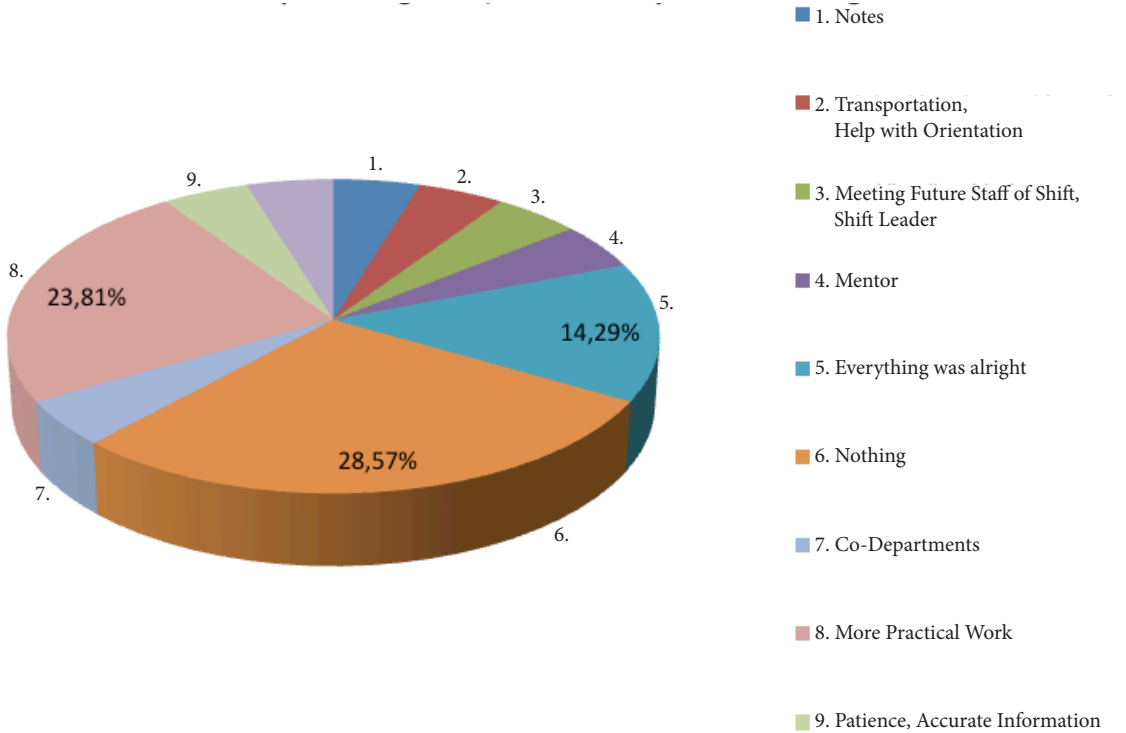
A potential change may arise from the development of the educational system, which possibly improves the weaknesses side, and as a result reduces a source of threat.

Inclusion of Employees

Using the questionnaire feedback from 50 new employees, the following results were obtained about the topic in question.

The objective of Question 19 was to find out how, according to new employees, the integration of new colleagues can be made easier. Presently, Week 1 is for training, which means operators work office hours during the training week, and from Week 2 on they start shifts and are considered 100% employees. At the same time, the learning period is three months, which is concluded with an exam.

Graph 6. Evaluation of Questionnaire Related to Facilitating Integration.



Source: Own Compilation on the Basis of Evaluation of Training, 2015.

According to a majority of respondents there is no factor that could facilitate integration. However, 23.81% think that the first days could be made easier by increasing the proportion of actual practical work. This means they think that an increased amount of practical training could facilitate integration.

Potential Solution

The importance of human resources management is confirmed by the fact that the workforce, their knowledge, skills, abilities have a central role in the lives of companies and in the value adding process itself. It is a well-known fact that added value is created by activities based on knowledge, time may be reserved for the different modules and tracing can be a lot smoother then in the present system. The new instruction material was prepared by the leading technician of the area on the basis of the operational instructions and parameters required for a successful exam combining them with the actual work processes that are not included in the operational instructions yet constitute an integral part of quality work. The instruction materials have been prepared on the basis of TWI (Training Within Industry) known in the industry, which includes teaching methodology as well. [7]

Table 1. Modular Instruction Materials of Frame Bonding Area with the Number of Slides.

Title and Number of Module	Slide
1/20 Introduction to Area	3
2/20 General Technological Process	3
3/20 Raw Materials, Tools	13
4/20 Responsible People	2
5/20 Documentation	15
6/20 Structure of Bonder, Basic Software Knowledge	13
7/20 WT Replacement and PR Stoppage	6
8/20 Frame Heating	5
9/20 Use of GE Testers	7
10/20 Replacement of Wire	7
11/20 Cleaning of Wire Binding Tool	7
12/20 Replacement of Wire Guide	7
13/20 Replacement of Blade	7
14/20 Stempel Exchange	15
15/20 Daily Maintenance	6
16/20 Software Item Change with Operator Access	20
17/20 Post-Production, Error Prevention, Error Handling	4
18/20 Scher Test	11
19/20 Most Common Errors on Bond Area and their Solutions	20
20/20 HPBM	6
TOTAL	**177**

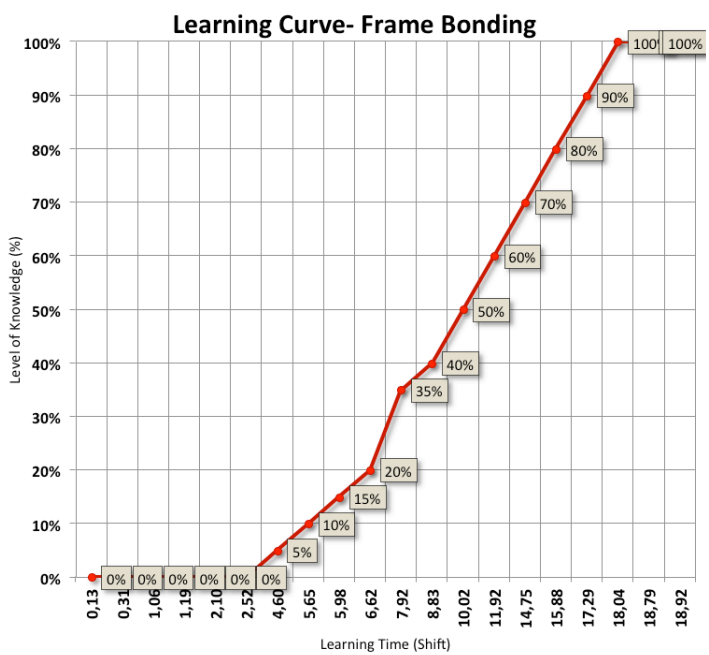
Source: Own Compilation on the basis of Eway4 Data, 2015.

[7]: Liker, K. J. (2008): *The Toyota way.* Budapest: HVG Kiadó Zrt.

I. Preparation Phase:
– Short conversation between trainer and trainee
– Make sure to explain the subject of instruction to trainee
II. Training Phase:
– Demonstrate and explain (with the help of instruction materials)
III. Asking for Recital, Testing:
– Training plan should determine progress, and trainees must be tested on the taught material after every module (repetition of module not more than twice)

Result

Graph 7. Learning Time of Frame bonding by Module.



Source: Own compilation on the Basis of New Instruction Materials, 2015.

The Table shows all the modules, the definition of the level of knowledge and the time reserved for them, which include testing as well. This helps to calculate how long it takes for a new employee to train for the area and become a 100% employee. By Shift 11, their knowledge reaches 50%, and thus are able to produce value for the company.

Comparison of Results, Conclusion

Table 2. Quantitative Comparison of Present and Future Training System.

Present Training System (01/02 – 01/06/2015), Values per Person		
	Good Pieces	Rejects [pieces]
Trained Operator	46080	1083
New Operator	32523	1587
Difference	13557	504
Modular Training System (22/06 – 22/10/2015), Values per Person		
Trained Operator	46080	983
New Operator	40320	1124
Difference	5760	141
Total	**7797**	**363**

Source: Own Compilation on the Basis of Survey Data, 2015.

With the introduction of the modular training system, a new operator can produce 7,797 more items during the four surveyed months than during the present training period. At the same time, the number of rejects decreased by 363.

In the course of preparing this study, I identified the source of error that also affects new employees, as well as explains the increase in fluctuation and the loss during manufacturing. I used a questionnaire during my research with the help of which employees were included on the basis of the Kaizen Principle, and I

made efforts to give new employees a chance to offer and share their opinions with the concerned parties. The surveys show that with this development, a new operator can produce 7,797 more items than before the development. This difference results in achieving the monthly target numbers, with the help of which those working on the production line can achieve the target numbers set by the management, which also affects the bonus system and thus increase employees' satisfaction.

JUDIT MUKANOVICS *

Preparation for assessing pupils in teacher training

Abstract: Most students concentrated on their selected subjects during their studies. They were certainly aware that as future teachers, they will have to assess their pupils impartially, without bias and with conscious preparation, but they had not made the hows clear for themselves yet.
A teacher's work is mostly measured through the successes or failure of their pupils. As a result, what a future teacher has to prepare for in addition to the art of transmitting knowledge is assessment. And in most cases assessment will only be possible using tests.
Keywords: Selected subjects, conscious preparation, assessment, using tests.

Összefoglalás: A hallgatók jelentős része a választott szaktárgyaira koncentrált a tanulmányai során. Természetesen tudták, hogy nekik, leendő pedagógusoknak majd tárgyilagosan, részrehajlás nélkül, tudatos előkészítettséggel kell majd értékelniük, de a mikénteket és hogyanokat még nem tisztázták le magukban.
A tanárok/tanítók munkáját legtöbbször a tanítványaik eredményeivel, sikereivel vagy sikertelenségeivel mérik le. Így az, amire valójában egy leendő pedagógusnak fel kell készülnie a tananyag átadásának művészetén kívül, az az értékelés. Értékelni pedig legtöbb esetben csak méréseken keresztül fognak tudni.
Kulcsszavak: Választott szaktárgyak, tudatos előkészítettség, értékelés, mérések.

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The selected research topic is based on the thought and experience how difficult the student teachers I have known throughout my career, and career-starter colleagues find evaluation during their practice or work.

My experience related to assessment:

They started assessment using a lot of stereotypes, doing it superficially or being afraid. There were some who misevaluated their pupils' work with unnecessary self-assurance, too much self-confidence, because they did not have the suitable instruments or knowledge for it. They did not possess the proper processes, I even had a suspicion they had not even read the related special literature either.

Most students concentrated on their selected subjects during their studies. They were certainly aware that as future teachers, they will have to assess their pupils impartially, without bias and with conscious preparation, but they had not made the hows clear for themselves yet.

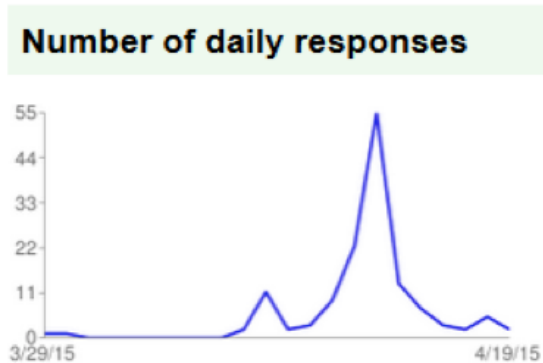
A teacher's work is mostly measured through the successes or failure of their pupils. As a result, what a future teacher has to prepare for in addition to the art of transmitting knowledge is assessment. And in most cases assessment will only be possible using tests.

My experience is that most of the testing performed by student teachers during their teaching practice posed serious problems to them. The preparation of the tests, the selection of the suitable tasks (so that it could measure exactly what and how they want to measure), the development of the scoring system, drawing the lines between the marks, or even the preparation of their pupils for specific tests brought about problems and continuously posed questions. It was not only the contents that gave them plenty to think about when preparing the different measurements, but even the format to be used.

It was these cases and experience that inspired me to discuss this topic. Then I tried to draw up a questionnaire which may provide me with answers to the questions which arose. While preparing it, I thought the topic should not be approached from one angle only, but it would be exciting to interview active young teachers about the topic. As a result, I did not only approach future teachers studying at college or university, but asked young teachers about their memories, opinions and experience thus exploring the difficulties and problems of the lives of young teachers. This approach meant interviews with young, career-starter colleagues who have been teaching for 0–3 years. I thought that I could surely trust the opinions of the respondents who dared (and I should note, anonymously) to share the difficulties they lived through and had the bitter experience of.

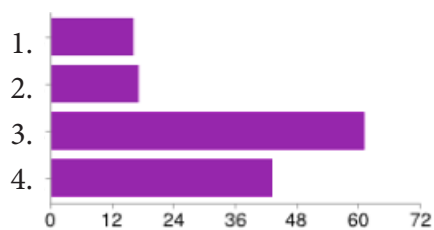
A total of 137 people filled in the online questionnaire, which I think, provided a suitable amount of data, opinions in order to evaluate the answers given to the questions and discuss the proposed hypotheses. The questionnaire was available for only 20 days in the spring of 2015, the online answers were given during that period.

Chart 1. Time breakdown of arrival of responses.



One of the questions was the following: *Is / Was there or Will there be a subject at the school where you study that taught/teaches you how to assess your future pupils?*

The answers obtained were the following:

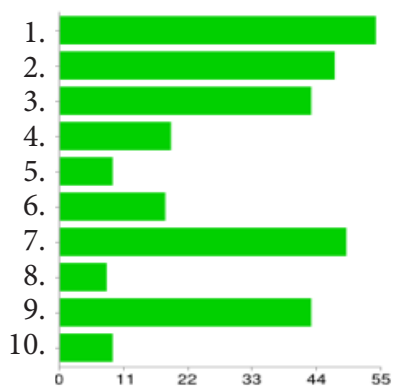


1. We haven't had this kind of subject yet, and unfortunately won't in the future	16	11,7%
2. We haven't had this kind of subject yet, but we will	17	12,4%
3. There was/is/will be this kind of subject within which we also study about it	61	44,5%
4. I'm already at work	43	31,4%

The answers showed the following: (61+17)=78, which leads to the conclusion that the present students of the higher education institutions who answered the questionnaire have in some form or other already familiarised or will familiarise themselves with the special literature on assessment and evaluation, and have studied some parts of it. They have no aversion to the topic, what is more, they are even interested in expressing their expectations and needs as well as what else they would need in this topic. When seeing these results, I thought the answers given by the young teachers already working will also be very promising.

However, a very saddening figure in this part is the answers of the 16 student teachers who had never seen this topic during their higher education studies; they had nothing else left but build on their own experience during their careers. I hope the institutions organising the training sessions will think of those who have never received any training of assessment-evaluation at all, and help them have the opportunity to broaden their knowledge, learn the secrets, processes and ways so that their pupils will be satisfied to have a teacher whose assessment work shows quality.

The following is the breakdown of answers given to the most evident question:
What does assessment mean to you?



1. Marking	54	39,4%
2. The oral assessment that teachers give their pupils while teaching them	47	34,3%
3. Written assessment (NOT marks) that teachers give their pupils during/at the end of certain activities	43	31,4%
4. The part of my future work that I fear most because I don't have any experience in it	19	13,9%

5. A negative phenomenon that may change pupils' attitude to learning in a negative way	9	6,6%
6. I can't see its difficulties yet, but I hope I'll cope	18	13,1%
7. The results of a complex process	49	35,8%
8. A necessary bad task	8	5,8%
9. I'M ALREADY AT WORK	43	31,4%
10. Other	9	6,6%

The answers marked for and explanations given to Question 5 also resulted in unexpected data. On the basis of my general experience, the fact that 54 respondents, that is 39.4% of all given answers, said that giving marks means marking to them, was the least surprising percentage value. Unfortunately, although there was a chance to give multiple answers, this single expression was the most attractive. The fact that up to four answers could be given slightly changes the breakdown of answers. This certainly does not mean that all the respondents used all the four options. But a significant part of them marked several answers, thus making the percentage breakdown of the answers more easily interpretable.

It was very interesting to me about the answers given to this question that the word assessment is a word that carries a negative meaning for 17 (9+8) people. I think future teachers should have a more positive attitude towards assessment, even if this word brings back negative memories for them personally. They should have the strength to change this. If nothing else then due to the important task that they will become one of the assessors of future generations, which is not a negligible fact.

One of the most exciting parts of this question was the possibility to express "other" thoughts if there was no option among the given ones that could reflect the respondent's opinion. Fortunately, nine of them used this opportunity and answered the question in their own words, which were the following:

"Other" answers given to Question 5:

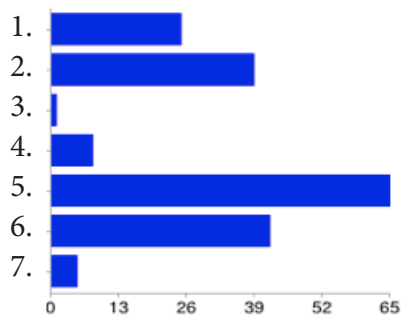
1. Oral assessment (as well) which pupils, parents and teachers need as well, and which does not only assess using a mere mark (number), but also details the weaker/excellent parts to show what the things that are going well are, what should be paid more attention to. (student teacher)
2. Oral or written feedback about the performance of the pupil, which I think is effective if it provides something to use in future development. (student teacher)
3. An important part of my future work that involves a great deal of responsibility, which can be utilised in many different ways. (student teacher)
4. Feedback, a necessary element of development. (student teacher)
5. Motivation for further work (teacher)
6. Assessment is feedback about the pupil's work both for pupils and teachers. It can be either positive or negative, but the positive type should be used more often. (student teacher)

7. An opportunity that helps me encourage children. (student teacher)
8. All the things that teachers communicate as feedback, send to their pupils in order to improve or reinforce them. (student teacher)
9. A thing with the help of which I can give feedback to my pupils, can motivate and encourage them. (student teacher)

These answers speak for themselves, so I will not analyse them.

However, the answers given to Question 7 also posed serious questions about the needs of students in higher education.

What do/did you expect of the subject that taught you the assessment of your pupils' work?



1. Some guidance	25	18,2%
2. Preparation with subject-specific examples	39	28,5%
3. Theory, I am aware of the practice	1	0,7%
4. Practice, I am aware of the theory	8	5,8%
5. Theory and practice: I need both	65	47,4%
6. I'M ALREADY AT WORK	42	30,7%
7. Other	5	3,6%

However promising was the fact that in Question 5 so many respondents marked they had studied or would study pedagogical assessment and evaluation during their training, this set of answers does not reflect its efficiency. Rather the fact that the subject taken up either posed questions that made students unsure, or did not even pose any questions only supplied them with some facts. However, such unanswered questions have an effect on more interested, open students and they start thinking about them. And this may even cause those who are hesitant, inexperienced to start having doubts. The situation is good if future student teachers, when they feel the lack of answers, start looking for opportunities to remedy the deficiency. Since they have realised: it is no use becoming a good nursery school teacher, primary or secondary school teacher without assessment and evaluation, since children and pupils are not necessarily interested in the heights of academic knowledge rather in the humane feedback that lends them wings, encourages their knowledge and continuously motivates them.

Then let us again take a look at the figures of this question. On the basis of their own self-assessment, 65 respondents need both theoretical and practical knowledge. This means that the courses taken during their training were not enough for them to confidently start doing this essential part of their careers.

There were only a total of nine answers where respondents felt sure of something, either practice or theory, which is insignificant compared to the total. Yet, two answers could be marked at this question.

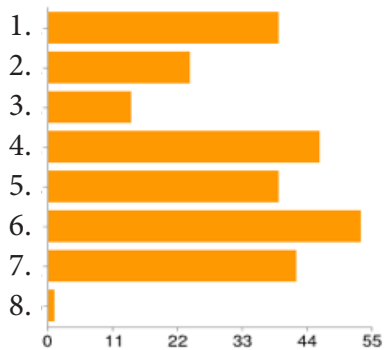
At the same time, five respondents had "other" thoughts, which they shared with me:

1. I'd expect things of this subject, but we won't have it, one of our teachers has spoken about the preparation of assessments, but even he discussed it only once.
2. Since we won't have it, I don't think I should have expectations of the subject.
3. Alternative thinking.
4. Feedback.
5. Nothing useable.

I would like to mention two answers that deserve attention: two male colleagues, already working (respondents 77 and 104 of the questionnaire) both chose the option: „*Both theory and practice: I need both.*"

This again poses the question: how can teachers who are unsure of how to handle this topic finish college or university? How can we entrust teachers who are unsure of how to assess the knowledge of their pupils, how to evaluate their skills, abilities or even just their progress with teaching our kids?

I would like to mention answers given to one more question:
Which part would you mention as the most important one of the aspects of assessment and evaluation on the basis of the contents of the subject's curriculum?



1. Development of the scoring, set of criteria, and the method of this development	39	28,5%
2. Ways of wording oral, written assessment that teachers say (or perhaps write) when teaching	24	17,5%
3. Ways of comparative assessment	14	10,2%
4. Methods of setting up, developing assessment	46	33,6%
5. The method of preparation of (the proper) assessment tool that exactly assesses the teacher wants to assess in the specific topic	39	28,5%
6. Maintaining objectivity in assessment	53	38,7
7. I'm already at work	42	30,7
8. Other	1	0,7%

The importance of this set of data is that, through their choice of answers, respondents excellently demonstrated what are the fundamental and weak points of the subject that taught them assessment and evaluation. Which are the parts that they are still interested in? It is important to point out a few details: the first one is that 39 people consider the set of criteria to be developed for assessment and marking important. This choice is very interesting since it is marking that was mentioned as "assessment" in Question 5. Now, according to their choices, 28.5% of them are interested in the methods. What is more, they are unsure of how to develop assessment (46 people) or prepare the suitable assessment tool (39 people).

There is one more moral issue that these answers presented me with, namely, what kind of teachers are

trained in the Hungarian higher education system who even entertain the thought that the issues of objectivity and maintaining impartiality can be taught within the framework of higher education. I raise the question: why would anyone who cannot maintain their objectivity go and become a teacher? Why does the higher education system not rethink the psychological and occupational fitness evaluation within its entrance examination system?

Why is it only the knowledge of the academic subject that matters? What I mean here is not that I would only like people with mediocre or weak abilities to teach, but the fact that in addition to academic knowledge, the entrance examination should include occupational fitness evaluation as well. I think it would be very important!

There was a respondent (Respondent 34) who, by using the „other" option, left remarks in this box as well. Here is what he/she considered important: *„I would need a lot more practice than what the university can offer. This was the area the teaching practice placed the least emphasis on. Yet, it should be thought over in teacher training, a lot depends on what pupils think of themselves and on what their teachers think of them, their knowledge, their work."*

I suggested three hypotheses at the beginning of the research that I sought answers to. As I have mentioned earlier, I obtained the answers through online questionnaires. The three statements I have made and the answers I think arise from the answers are the following:

First Statement

Hypothesis1: My observation is that the future teachers studying in the Hungarian higher education system mostly imagine the methods, ways, tools of assessment based on their own experience, and the higher education adds very little to it.

Conclusion1: The observation that teacher candidates leaving the higher education system may rely on their own experience when they start their teacher career is not entirely in accordance with facts. The answers have shown that there is added knowledge in most cases, although there are institutions where new graduates have only theoretical knowledge when they leave the college or university. There are institutions where they try to strengthen practical preparedness as well, but unfortunately the results suggest these young people do not feel their knowledge is solid. They would require a lot more. They would like their schools to send them off with diplomas that ensure they can stand in front of their pupils with confidence. One of the respondents put it into words in the following way:

I would need a lot more practice than what the university can offer. This was the area the teaching practice placed the least emphasis on. Yet, it should be thought over in teacher training, a lot depends on what pupils think of themselves and on what their teachers think of them, their knowledge, their work.

Second Statement

Hypothesis2: I do not think it shapes students' way of seeing things, or encourages them to prepare assessment tools. The Hungarian higher education system does not prepare them for properly these competences. The students are uncertain, as a result, they would require more, more regular help from the training institutions.
Conclusion2: The answers indeed suggested uncertainty. The lack of self-confidence is the result of unpreparedness. And this, in my opinion, could be rectified by further training so that the colleagues who have already left higher education but have not received proper training could develop their knowledge in this area.

My suggestions are the following: teacher training should be organised in this field. This could create new tasks for the organisers of training courses. It would be practical to present the new methods at these training courses so that teachers have their own personal experience of their usability. And this is not only about fresh graduates who have not received proper training, but also the representatives of older generations who have not studied it yet.

Since when the teachers who graduated in the '80s, '90s went to school only experienced frontal teaching methods. This is what they mostly have personal experience of and opinions about.

Since that method worked, because they are here as teachers, they also use it in their work. This suggests that in this case we are observing a way of the handing down of teaching methods.
Colleagues surely try out new ways since they are people with a creative way of thinking, but in the case of new methods, or when they results do not come at the expected rate, they will most probably quickly return to their old, well-known, habitual and generally tried and tested methods.

This is why I think that we should encourage the organisation of training courses which check the extent the material has been comprehended and applied not only then and there, but follow-up monitoring is also organised afterwards. It should be checked how the participants of the training utilise the studied materials in their everyday teaching practice. A site disseminating positive experience that participants of subsequent training sessions could use should be set up, or whose sample materials, as the products of some kind of brainstorming activities, could be used by any teacher.

Respondents of the questionnaire also marked their answers in a way that made it clear there is a need for such training in the field of assessment.

When asked "would you participate in a separate training session which teaches the practice and theory of it?" several respondents marked the option which said:

Yes, I would definitely participate because I consider it important.	22
Yes, when I am obliged to, and the sessions are centrally subsidised, I would participate.	20

Third Statement

Hypothesis3: Professional practice could help future teachers a lot to try and test themselves, gain some experience in the field of assessment and the use of the different assessment forms.
Conclusion3: I think this is really true. A practical session almost exclusively focusing on it would be needed, one whose length makes or may make it possible to gain plenty of experience, if not for other reasons then just due to its length.

One of the young colleagues filling in the questionnaire also voiced his/her opinion about his problem: Respondent 29 wrote the following:

Assessment is a difficult thing. It is difficult to separate the teacher's personal emotions towards a pupil when his/her knowledge is assessed. I think a lot more time should be spent doing teaching practice, a semester or even a year so that future teachers obtain a more accurate picture of how to handle certain situations, and of certain methods of assessment, and when it is only them who have to decide in a real situation, they would have a whole lot of experience under their belt.

I should add it would be advantageous if colleagues with a degree in assessment-evaluation also undertook mentoring tasks and support novice colleagues since it helps a lot to develop the proper way of seeing things when it comes to assessing and evaluating how the taught material has been acquired. I do not think it matters what subject the teacher with the assessment-evaluation degree teaches, because it is enough to set the goals and overview the material to be able to help the mentored person with the preparation of the proper assessment.

I would like to point out that I arrived at this conclusion after processing and while evaluating the results of my own questionnaire. I do not think the needs that have become clear to me can be met at a moment's notice, but we should strive for it since our higher education system should "produce" teachers who are able to use these conscious, progressive and accurate assessment techniques in their teaching jobs. We should also reflect on how the certificate connected to the (semester-)long teaching practice should be regulated in order to ensure that the young colleagues who seem to be almost incapable of assessing their pupils have definite skills by the time they have to stand in front of a classroomful of pupils.

MÁRIA SOMOGYVÁRINÉ NÉMETH *

A school is a mine of opportunities – or all-day schooling as a form of education at the primary school of Sárszentmiklós through a parental satisfaction survey

Abstract: From 2011 on, with the renewal of the public education system, all-day schooling became one of the most often used phrases. The term itself quickly became a matter of common knowledge, however, its actual meaning, the background to this learning form was seen only by few school managements and teaching staff as feasible and effective innovation. Due to the differences between schools and their traditions, it really is not an easy task to develop a uniform school organisation form which is equally feasible all over the country, yet the law that introduced this new educational form came into force on 1st September 2013.
Keywords: All-day schooling, school organisation form, differences between schools.

Összefoglalás: 2011-től, a köznevelési rendszer megújítása kapcsán az egyik legtöbbet használt kifejezés az egész napos iskola lett. Maga a szószerkezet gyorsan beépült a köztudatba, azonban annak valódi jelentését, e tanulásszervezési forma mögöttes tartalmát csak kevés iskolai vezetőség és nevelőtestület látta megvalósítható és eredményesen működő újításnak. Az iskolák közötti különbségek, hagyományok miatt valóban nem könnyű feladat egy egységes iskolaszervezési forma kialakítása, mely egyformán működőképes az ország bármely pontján, mégis 2013. szeptember 1-jével hatályba lépett jogszabály alapján bevezetésre került az új oktatási forma.
Kulcsszavak: Egésznapos iskola, iskolaszervezési forma, iskolák közötti különbségek.

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Introduction

I am among the lucky teachers who has been working in this educational organisation type from the first day of my career. This is where the idea of this empirical research also comes from, since our institution has 40 years of experience with all-day schooling. Teachers teaching here have given positive feedback about this form of education, but the question of what parents think of it aroused. What experience do they have? Do they also consider their children's development as successful and effective as their teachers do? I have had several questions and since we have not performed any surveys or satisfaction research in this area at our institution, it thought it was time we asked our pupils' parents to evaluate the success of all-day schooling at our school.

I thought the majority of respondents would express their satisfaction with our school; I would like to discuss the fact that the results from the feedback were actually positive, reassuring at the end of my paper.

An average school year has 181 days in Hungary. The pupils – especially those in their junior years – spend over eight hours in the school. The question may arise: how do they spend their free time, what activities do our pupils have after the school lessons? If we only consider their socio-economic status, we can picture the differences that arise from it. While the children of lower income families have fewer opportunities to participate in extracurricular activities that cost money, pupils from better-off families may develop their skills in different areas.

At the same time, the problem of doing their homework and learning the material for the next day arise. It is especially children whose parents' level of education does not make it possible, in whose cases it is difficult to follow homework, or where parents see less of their children because they work shifts or due to lack of time they cannot pay enough attention to their children's schoolwork.

I think all-day schooling can offer a solution to remedy and solve the above mentioned problems. If schools provide equal opportunities for their schoolchildren to develop and evolve their abilities, to catch up on work, then they compensate for social inequalities as well in the long run. In addition to all these, with the all-day supervision parents cannot only rest assured that their children are safe till 4 pm, but they are also ensured that their children not only do the tasks they have been given, but they do them under the supervision of the teachers who teach them, their work is checked daily, and their afternoons are filled with quality programmes.

In addition to learning about the opinions of the parents of the pupils in years one and four, the objective of my research is to review their attitude to all-day schooling as a form of education, specifically to explore their expectations of all-day schooling.

When evaluating the results of my explanatory, exploratory research, I sought answers to the following questions:

– How useful and well-functioning do parents consider the introduction of all-day schooling?
– Which factors do they consider the most important when they think of the advantages of all-day schooling?
– Why was it this school where they registered their child?
– What do they consider the strengths of this school?
– How satisfactory do they consider the services, equipment of the school?
– Which activities do they prefer of the afternoon ones?
– What do they think of the atmosphere and set of requirements of the school?
– What form and frequency of communication do they consider the best between the school and parents?

These were the questions I was seeking answers to when I started working on this topic.

All-day Schooling As Seen in the Special Literature

Libraries can offer rather little special literature to those who would like to broaden their knowledge about the history of all-day schooling. We can surely read studies about international experience and Hungarian possibilities, have an inside view of researches that are about all-day activities, that is, about the past and operation of day care and boarding schools, however, the introduction of all-day schooling is so new that very few printed publications have been published about the already available experience.

When I started my research, I found it important to review the legal background of all-day schooling, which takes us closer to understanding the meaning and objectives of all-day schooling. It is guided by Paragraph 19 Section (1) of Ministerial Decree 20/2012. (VIII. 31.) (Ministry of Human Resources) on the operation of public education institutions and on the use of names of public education institutions as follows: *„… In the case of all-day schooling and education, the compulsory lessons and other activities shall be organised in an evenly distributed fashion between the morning and afternoon periods in an alternating fashion, and keeping pupils' proportionate workload in view."* [§19 (1) of EMMI Decree 20/2012 (VIII. 31)]

Edit Sinka defines the term all-day schooling from a pedagogical point of view: *„…where teaching and free time activities are mixed, a more flexible daily schedule may be developed, which results in a more balanced workload for pupils. Pupils only go home in the evening, but in return, they do not have any homework, and the daily activities of the school allow for catching up, talent support and sport or other activities as well.*

This means, just the fact that there are lessons from morning till evening does not make a form of education all-day schooling." [1]

Definitions also place more emphasis on the development of a more balanced organisation of work, since this can increase children's performance, thus improve their academic results. Due to the calm atmosphere created at schools, pupils' personality traits may develop more positively, while due to the participation in varied afternoon group activities, their sense of belonging to a community is strengthened.

„*Schools shall prepare their pedagogical programme as stipulated in §26 (3) of the National Public Education Act.*" On the basis of this, the following should be provided within the framework of all-day schooling: „*… help with homework, extra pedagogical support for schoolchildren who for any reason have learning difficulties or problems with interpreting the study material so that they understand and acquire it, remedial and talent support activities.*" [§19 (3) of EMMI Decree 20/2012 (VIII. 31)]

Mária Kőpataki Mészáros emphasises the individual: „*In all-day schooling, teachers have the opportunity, as well as the time, to tailor their activities to their pupils more. The school addresses individuals, pays attention to them, and arises their thirst for knowledge.*" [2]

If the law is observed, all students are able to prepare for the next day's lessons in accordance with their abilities, learn studying techniques that are advantageous to them and acquire the ability to study independently. All in all, pupils who perform weaker take a liking to studying due to having a sense of achievement.

„*The maintainer shall ensure the free books and meals for pupils who are eligible according to the provisions of other laws even when all-day schooling and education is organised for them.*" [§19 (4) of EMMI Decree 20/2012. (VIII. 31)]

This means that presently all pupils enrolled in the first and second years receive free books regardless of their family status, income, the financial conditions of their families, or the number of siblings. Furthermore, pupils who require constant care, have special educational needs, live in families raising three or more minors and those who receive regular child protection benefits are also eligible.

„The maintainer, with the cooperation of the head of the institution, shall

[1] Sinka Edit (2011): *Egész napos iskola – Mi is ez voltaképpen?* 3 November 2011 [online] http://www.koloknet.hu/?1679-egesz-napos-iskola-a-mi-is-ez-voltakeppen [Downloaded: 12 January 2015]

[2] Kőpatakiné Mészáros Mária–Mayer József (2013): A lehetőségek iskolája. *Új Köznevelés.* 69. évf. 9. P. 10–12. http://www.ofi.hu/sites/default/files/attachments/uj_kozneveles_9.pdf [Downloaded: 12 January 2015]

ensure the conditions for the secure storage of text books, exercise books and other learning equipment." [§19 (4) of EMMI Decree 20/2012 (VIII. 31)]

In addition to all these, attention should be paid to the environment surrounding the pupils, which ensures the necessary conditions for children's healthy life. The furnishing of the classrooms should be suitable both for curricular and extracurricular activities, should be aesthetic and ensure pupils feel at home. The book *Introduction to All-Day Education* by Zsuzsa Kereszty offers a lot of help to perform these tasks and find solutions, and provides a detailed description of the steps of arranging classrooms, the placement of the objects, tools pupils use. [3]

(5) The provisions of this Section for all-day schooling activities shall be applied in a phase-out system. [§19 (5) of EMMI Decree 20/2012 (VIII. 31)]

This means that all-day schooling as a form of education will not be introduced for all the years but from the first and fifth years on, and then in the next years new classes will join them.

Government Decree [110/2012. (VI. 4.) Appendix] describes the objectives and possibilities of all-day schooling: „*The continuation of both remedial and talent support activities must be ensured at schools thus supporting the efficient pedagogical processes of skills development. The activities beyond the compulsory lessons offer room to artistic education, physical exercise or other study and similar activities that fit the school's profile or encourage independent studying.*"

The first part of my publication discusses the meaning and the definition of the objectives of all-day schooling as a form of education on the basis of the special literature by exploring its legal background. Zsuzsa Kereszty's book entitled Introduction to All-Day Education provided a great deal of help to introduce the topic, which, through its detailed and logically built structure familiarises us with the form of education that has been around for decades but was only compulsorily introduced from 2013 on.

[3] Kereszty Zsuzsa (1984): *Bevezetés az egész napos nevelésbe* (Napközi – iskolaotthon – klubnapközi). Budapest: Tankönyvkiadó.

Empirical Study of Parents' Satisfaction with All-day Schooling in Years 1 and 4 of the Primary School of Sárszentmiklós

The chapter below describes the short history of the Primary School of Sárszentmiklós, which is the venue I chose for my research.

Presentation of the Venue of the Research - Primary School of Sárszentmiklós

Figure 1. Primary School of Sárszentmiklós.

The Primary School of Sárszentmiklós is the second biggest primary school of the town of Sárbogárd. It is located in the middle of the district of Sárszentmiklós. The pupils enrolled come from the following parts of the settlement: Sárszentmiklós, Rétszilas, Pusztaegres, Sárhatvan, Nagyhörcsök.

According to the foundation document of the institution, the Primary School of Sárszentmiklós is presently maintained by KLIK (Klebelsberg Institution Maintenance Centre). The nursery school and special services section of the former General Cultural Centre's school have been removed by now; it has a branch school in Nagylók, and in order to comply with the requirements of project maintenance, the operation of the community centre as its basic task.

The Past and Present of All-day Schooling at Our Institution

The following subchapters describe the past and present of all-day schooling in the Primary School of Sárszentmiklós.

Difficulties of the -Introduction

The idea, and later the implementation of the introduction of all-day schooling is connected to Béla Marth, a former teacher of Sárszentmiklós. It was his own experience that encouraged Béla Marth at the end of the 1960s to implement changes within the school system. He saw the children, whom he saw as his own ones, carrying the heavy school bags home day by day. When they went home from school, the parents, who arrived from work wearily, were compelled to deal with their children's more and more difficult homework. It was a problem how they should keep the pupils busy, and offer them activities that raise the level of their knowledge. They did not have any special literature to use for this pioneering job, they sought the opportunities to better and innovate the system on the basis of their own experience.

„We started work following my visit to All-Day School Nr 4 on Gorkij fasor in Budapest in the autumn of 1969. We agreed with the teacher of the first class then (Mrs János Simon) to develop a work relationship which builds on each other's work in all the cases, develop a common method in order to achieve better results. It was developed to today's level with help from colleagues Mrs Lajos Antal and Erzsébet Pintér. The county school inspectorate determined the uniformity of education-schooling, and how it was divided between two people in all-day schools. For the sake of success, we determined the three most important principles: the indispensable presence of connections between a) colleagues b) sharing work c) methods." [4]

A lot of time passed from the birth of the idea and its introduction. The switch did not happen overnight, neither did the persuasion of colleagues.

[4] Marth Béla (1973): *Útban az egész napos iskola felé.* (Lehetőségek, gyakorlatok, tapasztalatok a Sárbogárdi II. sz. Napközi Otthonos Általános Iskola munkájában). Sárbogárd: Fáklya.

First Steps: Making Classrooms Cosier

The classrooms, where the afternoon activities were held, did not have toys, only benches and chairs. Rugs were put in the classrooms, curtains in front of the windows, which made the classrooms cosier as well. First Uncle Béla brought in his own unused rugs. Later they were given nice, big rugs. The fairy tale, play corner was another novelty. When children finished their homework sooner, they could settle there and could build and play. The toys were made, collected by the parents. The copies of the images related to the drawings were put up on the walls. In addition to the large art albums, there were pictures, copies, and the ones made together by children and adults were framed.

The teacher Miklós Brúzsa and parents made the shelves for the bags. They even had covers and curtains on them to make them more pleasing to the eye. Children placed their bags on them in accordance with their seating plan, so they could easily find them.

The introduction of a hygiene bag – toothbrush, towel, soap – was a novelty, children brushed their teeth after meals. Elevenses was transformed into breakfast because experience showed children went to school on an empty stomach.

Methodological Innovations

The introduction of a short, quiet break into school life was a novelty, which Uncle Béla borrowed from nursery school. The smallest children – of years one and two – with their heads rested on their benches, listened to fairy tales or music, and often took a nap during this activity. Skilled fathers, upon the request of Uncle Béla, prepared a so-called „lésza" and they put the mattresses brought from home on it. The children who felt tired could lie on them. Uncle Béla, ahead of his time, considered it important to ease the transition from nursery school to primary school.

„Tales, telling stories was the task of our work year. Our objective with it was to ease the transition from nursery school to primary school, from junior years to senior years, to help make disadvantages disappear and facilitate the development of talented children." [4]

The experience of parents, children and the teachers involved was very favourable. They had time both for supporting children with outstanding talent and remedial

[4] Marth Béla (1973): *Útban az egész napos iskola felé.* (Lehetőségek, gyakorlatok, tapasztalatok a Sárbogárdi II. sz. Napközi Otthonos Általános Iskola munkájában). Sárbogárd: Fáklya.

activities for slower schoolchildren. Colleagues teaching in the junior years requested to change the 2–2 year division of the first four years into a 4-year system, within the framework of which they taught their pupils throughout the first four years in an all-day schooling setting. In order to make the educational-schooling work effective in an all-day setting, the cooperation of the two teachers teaching a class was essential. In accordance with their orientation, one of them taught the humanities, the other sciences. Practical subjects were divided between the teachers based on their interests.

Uncle Béla considered the following as important principles of division of labour and methodology:

„The discussion of the daily tasks takes place during the noon shift change, from 12:30 to 1:00 pm. This is when we record the results achieved. We outline the following period both in school and afternoon activities. Unsolved or unsuccessful attempts are registered. This is an important element of two people's work relationship because "non-planning" makes work accidental, or it becomes random, and our results verify the importance, results of division of labour." [4]

The specialty of the syllabus came from the unification of the class and afternoon work plans. A topic in literature was connected to slide shows, drama plays, puppet performances and learning songs during cultural activities.

The introduction of weekly assessment and the system of pupils responsible for something were also ideas from Uncle Béla. The positive assessment system did not build its requirements on prohibitions, black dots *(used in junior years as the equivalent of F)* were banished from school. Children should not be punished but praised.

Teaching was done in morning-afternoon shifts then. One of the teachers had the morning shift for two weeks, then the other one for two weeks. Organisation changed with time, weekly shifts followed since every Saturday became free. Teachers worked mornings one week, and afternoons the other week. [4]

An additional local specialty was „overlapping lesson." The compulsory tutoring of slower students was done in a way that while one of the teachers was tutoring the pupils, the other teacher was dealing with the rest of the class.

The next educational form of all-day schooling was the „rolling system." The system of one teacher teaching the first four years was discontinued, and education was done in the all-day schooling fashion from year one to year three. Years four and five were called and considered transition then. In order to solve this problem, teaching in lower years and teaching in upper years was used. The „rolling system" worked well, it has a lot of enthusiastic followers. It required flexibility from teachers. About ten years were necessary to have all junior year classes join the all-day schooling system.

„I think, based on the results we have achieved so far, it is possible to improve the quality of simultaneous work in this way." [4]

Determining the Effects, Good Practices and Development Opportunities of All-day Schooling on the Basis of the Research Results

Methods Applied During the Research

My research was conducted in the Primary School of Sárszentmiklós (hereinafter referred to as SÁI) in January 2015. I used stratified probability sampling to select my sample. Since I have exact knowledge of the number of students in the different years, the four junior years were my stratum, and chose the members of the sample that could provide the highest possible amount of information for my research, the parents of pupils from years one and four. The sample is representative since it properly reflects the characteristics of the population by age and proportion, which means that the proportions of the people with characteristics important to the research are identical in the sample and the population. The population is the junior year pupils of SÁI. Eighty of the 100 questionnaires were returned by the given deadline. I used the measuring tool I prepared myself to answer the questions I asked, which is of indirect type considering the source of information gathering. Respondents' opinions about the pedagogical programme of SÁI, the quality and result of education, teaching, the school environment, staying in contact and the opportunities offered by all-day schooling were the focus of my research.

I conducted pilot interviews before the actual administration of the questionnaire in order to make its questions more reliable and correct the possible mistakes. The information obtained during the research was coded and processed in the database of the SPSS programme. The questionnaire follows the following structure:

– background variables (gender, age …)
– opinions about the environment of the institution
– opinions about the school's equipment, services
– assessment of the school's educational and welfare work
– ways of staying in contact with parents
– advantages of all-day schooling as a form of education

My assessment tool contains both open and closed questions. Keeping the variety of my questionnaire in mind, I asked singe, multiple choice, scale and order type questions. The questionnaire is evaluated in smaller subsections below.

After having the results evaluated, I conducted a focus group interview with my colleagues, the main objective of which was to qualitatively check the quantitative results, to gather associations related to the research questions and to filter out the shortcomings mentioned by parents by encouraging creative ideas and new thoughts and seek solutions. The focus group research is discussed in detail after the research results.

Descriptive Statistics

Background Variables of Schoolchildren and Parents Included in the Research

The first question was about the gender of the pupil. The proportion of girls in the surveyed first and fourth years is 45%, 36 girls, that of boys is 55%, 44 boys.

An essential question for my research is whether the pupils participating in my research come from the school's district or enrolled in our institution from outside the district. It is 18.75% of the pupils involved in the research, that is, 15 children, who for some reason do not go to school in their own district but chose the Primary School of Sárszentmiklós as their alma mater.

Eighty-five percent of mothers, 68 people, participated in filling out the questionnaire. The conclusion that can be drawn from it is that it is the mothers who do the activities related to their children.

When examining the age distribution it can be seen that most respondents are aged 30–39, a total of 48 people. The number of those aged 40–49 is nearly half of that with 22 people.

Family background – especially the parents' level of education and the socio-cultural environment they transmit – fundamentally influences children's further lives, and through its value transmission it influences pupils' attitudes to school and learning. And the role of mothers is even more important here.

17.9% of mothers, 14 people, have some kind of a degree. A half of them, 8.9% or 7 people, have high level qualifications. It is mothers with secondary level of education that are represented in the highest numbers in the sample, 56.4%, which is 44 people. The proportion of those who finished elementary school is 16.6%. There was an unfinished elementary school option on the questionnaire in the level of education section, however, the number of respondents in this category was 0. I did not receive information about the level of education of two mothers from the questionnaires.

As regards the fathers' level of education, 10.6% of them have some kind of a degree or high level qualification, which is the lowest proportion of the listed qualifications. Seventy-two per cent of them, 54 people, have secondary level education. Thirteen of them have a basic level of education. Similarly to mothers' level of education, no mentions were found in the unfinished elementary school category. However, I did not receive information about the level of education of five fathers, so they are missing datas in the questionnaire assessment.

The summary shows that most of the parents in the sample have a secondary level of education, which may significantly influence their children's lives later. The number of intellectual families is low.

Aspects of Choosing a School

Following the examination of the social background, I wanted to find out what motivated parents to enrol their children in this school. Why did the parents from outside the district find the Primary School of Sárszentmiklós more attractive than the one in their districts? What do they feel the school's atmosphere is like, and how would they recommend the school to an acquaintance who is about to choose a school now? The following subsection discusses the answers given to my questions.

58.7% of parents filling in the questionnaire, 47 people, were fully aware of the school's requirements when they enrolled their children. Twenty-one parent called themselves rather informed when asked, while six people felt they were suitably informed about the conditions of the school. Compared to the high percentage of more informed parents, the number of parents who are rather not or not at all informed about the school's requirements is lower, a total of six of them can be found in the sample.

In order to obtain a more detailed view of parents' opinions, why they chose this school for their children, I asked them to rank the options I provided. It can be seen that the criteria with lower scores are at the top of the ranking parents established, while those with higher averages can be found at the end of the ranking. The most attractive elements are the high-level of teaching and the all-day schooling format, while local people mentioned the fact that the institution is in their district as a convenience factor.

All-day schooling ensures a balanced workload for students, which presents an opportunity to increase work efficiency, differentiate and solve individual problems. As a teacher, I certainly experience this advantage of all-day schooling every day. In addition to my own impressions, I was eager to learn about the parents' opinions as well, who have a different perspective of their children's education, whether they consider the workload of our pupils suitable at our school.

Forty-five per cent of parents, 36 people, think the workload of our pupils is totally suitable, while 32.5% of them consider it rather suitable, and 15 people consider this workload partly suitable. Three parents' are on the opinion that our pupils' workload is rather not suitable, which means they would change it.

In addition to the proper workload for pupils, I also consider the opportunity to have a real sense of achievement important. If pupils have a series of successes at school, their self-confidence is strengthened, they value themselves more, their behaviour will eventually adjust to this, and we will raise more courageous, more self-confident children. I think it is justified to pose the question whether our school offers enough opportunities to have a sense of achievement.

Nearly half of the parents filling in the questionnaire, 37 people, think our school offers plenty of opportunities to its pupils to have a sense of achievement. Thirty-one people said rather yes, which means, 85% of them see success, so the trend has shifted in a positive direction.

Ten per cent of respondents, 8 people, think the opportunities the school provides are only partly enough to achieve success. Four parents have rather negative experience related to this question, so they

think there should be more opportunities for children to achieve success.

Important feedback can be obtained about our school when parents are asked *How would you recommend your child's present school to an acquaintance who is about to choose a school?* I asked the parents to give reasons for their answers.

77.5% of parents, 62 people, would gladly, with clear conscience, recommend our school to an acquaintance who is about to choose a school, while 15%, 12 people, with some reservations but would do it. The reasons they offered in open answers were the following: they feel their children are secure, they have good experience. They are satisfied with the quality of education and consider it good, and the perfect equipment of the school just adds to it. The warm hearted, kind, helpful teachers bring the best out of all the children, as a result, they can cope with problems in other institutions after they leave this school without having to make special efforts. Several of them consider our school relatively the best school in their district. In addition to the listed factors, another attractive thing is all-day schooling as the form of education.

The following results were obtained about the atmosphere of our school: 72.5% of the parents, 58 people, consider the atmosphere of the school child-centred. I asked them to give reasons for their choice in a sentence: most respondents consider the atmosphere of our school child-centred, because the children get to like the school, the subjects, the teachers, and thus learning. The children's skills are taken into consideration, the children's needs are paid attention to, and teachers keep their interests in mind. The classrooms are child-friendly, which ensure a calm and homely atmosphere. In addition to paying attention to how much workload to put on children, their knowledge is developed in accordance with their abilities. There are different talent support programmes. It is a school that is not crowded, aspiring to high quality, where children's opinions are considered, they are listened to.

Twelve people think the atmosphere of our school is humane, while there are 5–5 people who feel it is democratic, or strict, and iron discipline is typical of it. Democratic because both teachers and pupils can achieve their goals at the school. They consider it important that children can also make decisions about certain things, and this is achieved here. The strict atmosphere was mentioned because of the isolation of parents.

I thought it was important to give the parents the chance to express their opinions, thoughts in their own words about why they like that their children go to this school. The parents mentioned the following reasons: „They consider children's individuality, abilities." „He/she is paid attention to, they make learning liked, teach him/her independence." „They are given stable foundations." „My kid feels good at school, has a lot of experiences, and gets a lot besides education." „Education is at a high level, the teachers' work is perfect. I only have good experience." „I have a very good opinion about and experience with all-day schooling." „Cleanliness and order welcomes the children, where they can effectively study." „A very strong school and there is proper discipline."

All in all, it can be said that all the conditions are present for the children to ensure their development and successful progress in their studies. The several years of experience and knowledge of teachers is an addition and by properly motivating their pupils they are able to transmit it and thus maintain the quality of education.

The Level of Professional Work at Our School and Its Set of Requirements as Parents See Them

As parents have already expressed it above, our school offers high quality education which provides stable foundations for children and so helps them to cope with problems in other institutions after they leave this school. But how can a parent evaluate, assess the quality of professional work at a school? I asked respondents to rank the four options I listed according to which method seems to be the best filter.

During the evaluation I used the average of the categories the parents ranked, on the basis of which the most frequent way to measure and assess the level of professional work at a school is to check the averages of the different subjects. Listening to what children have to say about it was placed second, while the results of academic competitions were placed third. Entrance exam results as a category came last perhaps because parents follow the lives of other students to a lesser extent and thus they do not have information about which secondary school and with what type of results they were admitted.

School assessment systems have been criticised several times in history, perhaps this is one of the elements of education where the history of assessment of a school is as old as the debates about them. In view of this, I asked parents how satisfied they were with the assessment system they school had.

Nearly half of respondent parents, 48.75% or 39 people, are totally satisfied with the assessment system of our school, and 38.75% of them also consider it satisfactory. 11.25%, or 9 people, have some objections to the assessment system, and one person considers the assessment system of our school rather not suitable.

In addition to the assessment system, I found it important to ask parents what they thought about the school's set of requirements, since the answers given to this question provide the members of the staff with an image and encourage them to maintain the level or perhaps to change some things.

Parents only marked three of the four options. On the basis of these, nobody thinks that our school's set of requirements are weak. Half of respondents, 50%, consider it rather strong, 46.25%, 37 people, suitable, and three parents feel that the requirements teachers have are too high.

In order to improve the efficiency of our school, I asked the parents to mark three answers on the list that they think would best describe the strengths of our school. I offered them 10 options, which included statements on education, free time and the atmosphere of the school.

The majority of parents, 73% or 58 people, mentioned the teachers themselves as a strength of our school, closely followed by all-day schooling at 65%, 52 people, among the best elements, while the quality

of education is placed third. The results call our attention to the areas we need to improve, develop. On the basis of them, language teaching, sports, talent support need renewal, since they received relatively few votes.

Parents' Opinions about Our School's Environment, Services and Equipment

Parents are more and more sensitive to the school building, how well-equipped it is and what the environment is like. The school management tries to maintain the building of the institution, the yards and sports field belonging to it tot h best of their abilities. Taking advantage of the competitions, continuous efforts are made to improve its equipment both in quality and quantity. Friendly atmosphere welcomes our pupils when they enter the building, which proves the constant, ever-renewing work of our teachers. The members of the staff are aware how much background work is needed to ensure that our students spend their time at school in a safe and friendly environment. In order to obtain a more accurate picture of parents' opinions, I asked them whether they were satisfied with the safety and appearance of the environment, whether the environment helped to make the children feel good in our institution.

88.75% of respondents, 71 parents, expressed their satisfaction with the safety of our school's environment. Ten per cent, 8 people, consider it only partly suitable, while 1 parent feels the environment of the child's school is rather not safe. In addition to the mentioned four categories, the option not satisfied at all was also included, but no one chose it. All in all, it can be stated on the basis of parents' opinions that the environment of our school is safe.

Results almost identical to those obtained to the previous question were found when I evaluated the next question, namely, whether parents are satisfied with the appearance of the school, if it helps the children to feel good there. 88.75% of parents, 71 people, are satisfied with the appearance of the school, 8 only partly thinks this appearance is helpful for the children to feel good. One person expressed his/her dissatisfaction with the appearance of the school.

Our school offers leisure activities in different areas to its pupils, thus tries to satisfy the many types of needs that are related to their individual and age characteristics. It helps pupils to use their free time in a valuable way. In view of this, I asked to what extent the parents consider the services of the school satisfactory.

They could choose the one they considered suitable from the five categories I listed ranging from excellent (5) to unacceptable (1).

In the parents' opinions, the services our school provides all average above 4, which means the majority gave good or excellent scores to these options that are considered suitable ways to spend your free time pleasantly and usefully.

Contact between Parents and the School

It is essential for the development of the pupils and effective educational work to maintain communication between teachers and parents. Their meetings – which are partly organised (parents' nights, meetings by class), or are flexibly adjusted to the parties' needs – serve the purpose of mutual information gathering and problem solving. *„Teachers are obliged to regularly and thoroughly inform the parents of minors in writing and in words about their academic work, behaviour.*" (§14 of Sect. I of Act on Public Education).
The way and frequency of the communication between the school and parents greatly depend of on the parents' attitude. This is why I asked the question what kind of ways, methods they consider the best, most proper for maintaining contact between the school and the parents.

Most of them marked face-to-face meetings, conversations with the teachers of the particular subjects as the most suitable way of maintain contact. This was followed by parent-teacher conferences and parents' nights with similar proportions. Finally there was communication through schoolchildren's message book and over the phone, which parents consider less suitable.

Eighty-five per cent of parents, 68 people, mentioned they participated in almost all of the organised parent-teacher conferences. 11.25%, 9 people, only go occasionally to the conferences about their children and class, one parent only when problems arise, and two people do not use this opportunity to communicate with the teachers. I think the proportion of parents attending these conferences is so high because it is parents of pupils in the first and last years of their junior section we are talking about. They are the ones about whom their parents can learn the most, while in the years between them (years 2 and 3), or later the number of parents attending decreases.

As the way and frequency of the communication between the school and parents greatly depend of on the parents' personality, values, I think a different attitude can be observed in connection with the participation in school programmes. This is why I asked them how they see, to what extent they have the chance to participate in school programmes.

Although the majority of parents, 67.5% or 54 people, are satisfied with the opportunities they have to join school programmes, 15 people think this is only partly possible, while 11 of them do not or not at all see the possibility to participate in school programmes. I think the evaluation of these answers clearly points out the problem, that is, more opportunities should be offered to interested parents to become active participants in our school's life.

There are a lot of new expectations of schools nowadays. The process of education-schooling is considered modern, acceptable, functioning and right if it is person-oriented, considers children's individual needs and abilities, and meets these needs. My next question sought an answer to whether parents are satisfied with the way the school considers their requests, expectations.

The majority, 78.75% or 63 people, are satisfied since the school take their requests and expectations

into consideration. 11.25% or 9 people think their needs are met only partly, while according to 8 people, their requests are not or not at all considered.

It is necessary to join the forces of the school and the parents in order to efficiently develop children. Their joint thinking and harmonious cooperation are important factors in education. It is essential to be open to each other's arguments in the case of problems related to the pupils. Everyone has their own characteristic tasks arising from their roles. Consequently, the cooperative attitude, being ready to seek the best solution together is of great importance. This is why I asked the parents to what extent the school considers them as partners.

The proportion of satisfied parents who think our school considers them as partners is high, they make up 95% of respondents, which is 68 people. Eight people only partly, while 4 do not consider the school cooperative, and they evaluate this shortcoming as a negative feature.

Advantages of All-Day Schooling from Parents' Point of View

As it was mentioned in the Introduction above, the introduction of all-day schooling opens new doors to both teachers and schoolchildren, thus supports the improvement of educational results and helps social integration. Several additional advantages of all-day schooling can be mentioned, which I summarised as a list in the questionnaire. I asked parents to rank the advantages of all-day schooling.

The majority of respondents mentioned more balanced workload for students as the first advantage of all-day schooling. The second most attractive factor is that both teachers can see the children in the processes of guided and independent learning, in their free time among their peers, during the different free time activities, and thus more effective education can be achieved. The third advantage listed by respondents is that homework is supervised by the teacher teaching the specific subject, thus children are given a chance to instantly check their homework, and correct the mistakes if any.

Without doubt, schools have to adapt to the actual social needs of their time. This is exactly why the educational and teaching work done at schools have a responsible role, one that prepares our children to keep pace with technical, economical and scientific development. Extracurricular activities organised during the afternoon hours offer children countless opportunities to put the knowledge they acquired during the lessons into practice in different areas and make good use of it. In addition, it is expressed as an objective that they should be familiarised with free time activities that help them spend their free time in a more refined way.

My next question sought answer to the question which types of the listed afternoon activities parents prefer. For the sake of simplicity, they had to mark five of fifteen options, then rank the activities they chose according to their usefulness.

When the selected options are examined, it is definitely clear that all of the activities on the list were selected among the five parents were asked to pick. The most frequently mentioned activity was the developmental one, which 77.5% of respondents, 62 people preferred of the afternoon activities. An equal proportion, 55% or 44 people, marked adapted physical education and playful skill improving activities among the selected five activities. Folk dancing and learning to play an instrument were also included among the most popular activities. It is somewhat surprising, although deductible from the parents' level of education, that the presence of activities related to arts, ones requiring thinking are the least important to parents. The family that sets an example, the circle of friends that develops their attitudes and the tools used by the mass media are the ones that appear as the most general sources that develop education.

In one of the five PE lessons compulsory from 1st September 2014 on, our schoolchildren in their junior years attend folk dance classes. I wanted to ask the parents about it, what they thought of this opportunity. Unfortunately and surprisingly the sad fact is that a lot of the parents had not been informed about it in the first six months and only learnt about it from the questionnaire that their children are being introduced to the world of folk dancing.

The parents who were aware of this fact expressed their satisfaction and supported the presence of folk dancing in the future. As positive features, they emphasised the importance of movements different from physical education, the learning about folk customs, folk music and folk songs by preserving and practicing them.

The research detailed in my paper do not constitute the entirety of the parent satisfaction survey. Further, more in-depth research is necessary to draw conclusions after the assessment which can support the efficiency of all-day schooling at our school.

CSILLA SZABÓNÉ BARICZA *

Development of the attention of pupils in their junior years through free time activities

Abstract: My professional experience gained during the several years I spent as a day-time home teacher and then my activities in all-day schooling showed that teachers should place great emphasis on ability development during leisure time activities. My study examines the ability of attention. Since we remember most the things that we pay attention to, the central function of this field in learning, experiencing processes is inevitable. This paper discusses a 5-week-long attention development pedagogical experiment which I conducted with my second year pupils at my work place, Hunyadi Mátyás Primary School and Elementary Arts School in Perkáta. As their teacher, I developed my pupils' attention using playful tasks that can be done in our everyday practice, readily accessible and their effect on developing attention is well known. Although we use these activities, we cannot assess their effects as teachers. This is why I used the help of a psychologist and teacher of handicapped children.
Keywords: All-day schooling, ability development, learning, experiencing processes.

Összefoglalás: Több éves napközis nevelői szakmai gyakorlatom, majd iskola-otthonos rendszerben való tevékenykedésem alatt tapasztalataim azt mutatták, hogy pedagógusként a szabadidőben történő képességfejlesztéssel kiemelten kell foglalkozni. Dolgozatomban a figyelem képességét vizsgáltam. Mivel arra emlékezünk leginkább, amire figyeltünk, e terület központi funkciója a tanulási, tapasztalási folyamatokban vitathatatlan. Jelen munkám tartalmazza azt a figyelemfejlesztő, 5 hétig tartó pedagógiai kísérletet, melyet munkahelyemen, a Perkátai Hunyadi Mátyás Általános Iskola és Alapfokú Művészeti Iskola második osztályos tanulói körében végeztem. Tanítóként olyan játékos feladatokkal fejlesztettem a kisiskolások figyelmét, amelyek a

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mindennapi gyakorlat során elkészíthetőek, könnyen hozzáférhetőek, figyelemfejlesztő hatásuk ismert. Bár alkalmazzuk e tevékenységeket, tanítóként hatásukat mérni nem tudjuk. Ezért munkámat pszichológus és gyógypedagógus szakemberek is segítették.
Kulcsszavak: Iskolaotthonos rendszer, képességfejlesztés, tanulási, tapasztalási folyamatok.

Introduction

With the introduction of all-day schooling, a bigger and bigger burden is placed on schools as regards the organisation of pupils' free time activities. The pedagogical experiment we conducted confirms that successful ability development may be done through free time activities.

Role of Attention in Learning Processes

This chapter defines the concepts of attention and ability, then I place the ability of attention in the system of basic abilities constituting the personality. I will discuss the characteristics, attributes of attention, and its considerable role in learning processes. Of the attention tests, I will present Piéron's Attention Test, since this is the procedure that serves as the tool of my analysis.

Place of Attention in the System of Abilities

What is attention? The ability of attention is partly an inborn capacity, partly an ability to be developed. On the basis of our experience, we know general rules about attention that have been examined by psychology for centuries while placing them on a scientific basis. We are aware that we cannot pay attention to everything at a time, we cannot concentrate even on the most interesting things after a while, our attention grows weaker. If we are tired, we stop talking when driving if the traffic situation requires us to focus our attention. We use this mental ability in several areas of our everyday lives. Some minimal concentration of attention is a precondition for every psychomotoric and thinking ability. The state of increased alertness and apprehension, on the basis of which people pick certain things out of the diffuse background of their environment. In addition, attention is the most sensitive indicator of disorders in the area of mental health – although not always a differentiating one. On the basis of this we can state that attention is one of the primary and most important basic abilities of the human personality, whose importance is obvious in all parts of life. [1]

„Attention is the selecting, emphasising activity of our consciousness. Its physiological basis is negative induction, that is, the interaction of stimulation and hindrance. This means that the stronger a stimulating centre is in the cerebral cortex, the stronger the hindered area around it is." [2] The author illustrates the notion of negative induction with spot lights and the dark surroundings. If we narrow the focus of the spotlight, a smaller area stands out of the darkness, only a lot sharper, but when it is widened, we can see a larger area only a lot more blurred.

„Ability is a central notion both in psychology and pedagogy, it has different interpretations in different special areas of both branches. The different interpretations of ability agree on the fact that ability is a psychotic characteristic of the individual which develops through practice of some activity, and manifests itself in the performance of that activity. The basis of developing abilities are the different capacities (…) The many different types of abilities can be grouped on the basis of several aspects. There are several known groupings that classify abilities in two big groups. General abilities manifest themselves in a lot of types of activities, while special abilities appear in one or some similar activities." [3]

Everybody has general or basic abilities, differentiated by person both in quality and quantity. These ability groups make the successful performance of several activities possible, as a result, they are inseparable from our lives. They are placed in three large groups (see *Figure 1* on the next page)

– Cognitive abilities: they help with the right perception, learning about the world, orientation, interpreting and comprehending phenomena. Among others, attention belongs to this group.

– Psychomotor (action) abilities: as a result of coordinated, orderly movements, they help perform successful activities. The following are included: hand-eye coordination, manual skills, the ability to perform movements, series of movements, and ability of coordination.

– Communicative abilities: its components play an important role in relaying information, and establishing relationships between individuals. Such abilities are: speaking, reading, writing.

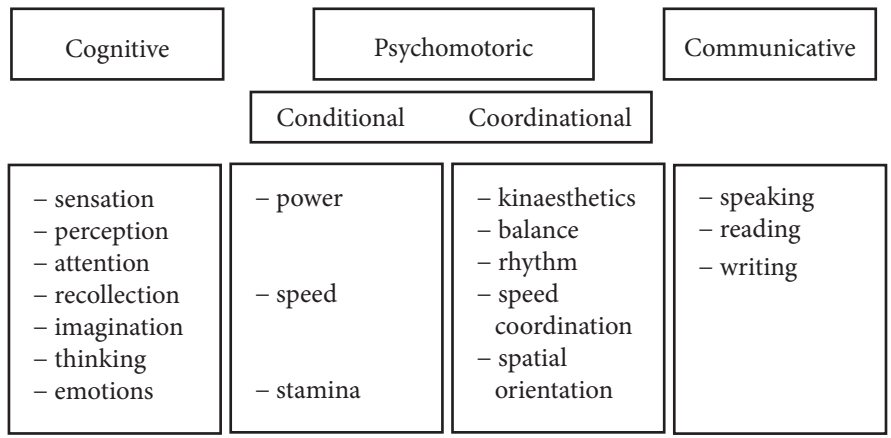
[1] Internal document of the Dunaújváros Branch Institute of the Pedagogical Services of Fejér County: Attention Test Instructions.

[2] Tóth Ibolya (2001): *A pszichológia alapjai.* Pécs: Comenius.

[3] Báthory Zoltán–Falus Iván (Szerk.) (1997): *Pedagógiai lexikon.* Budapest: Keraban.

[1] Internal document of the Dunaújváros Branch Institute of the Pedagogical Services of Fejér County: Attention Test Instructions.

Figure 1. System of basic abilities constituting the personality.



Source:[2015.03.11.]<http://tamop412a.ttk.pte.hu/TSI/Kiraly-Szakaly-Mozgasfejlodes és a motorikus kepessegek fejlesztese gyermekkorban / mozgasfejlodes_korr.html>

Characteristics of Attention

As regards its origin, reactive and active attention may be distinguished. The starting point of reactive attention is some object of the environment which triggers the person's mental selection. It is triggered by a call, activated by something. The starting point of active attention lays in the individual. Within it, we can distinguish voluntary, internally induced, spontaneous attention, and induced voluntary attention. By type, both active and reactive attention types may be concentrating (focused) and distributive (simultaneously focused on several objects). [1]

Attention is partly an inborn capacity, partly something to be developed. Involuntarily we turn towards loud sounds, are mesmerised by spectacular sights. Our *spontaneous attention* is directed towards all the effects that attract a lot of attention. The material to be learned at school also holds our attention if it offers enough excitement and coincides with our interests. There are several school activities that do not spontaneously captivate pupils, do not hold their attention, the

performance of which require conscious effort, will power. This form of attention (*voluntary attention*) has to be learned. It is not easy to concentrate our attention on one thing for an extended period of time, especially when the topic does not even interest us. It can be stated that paying attention is difficult mental work. [4]

The characteristics of attention determine its divisibility, span, durability and transfer. Every individual has a specific attention capacity, the amount of which depends on our actual condition. This can be divided between different automatic and controlled activities. The activities that we can perform automatically do not require attention effort. Through practice and experience, some controlled activities requiring conscious attention become automatic. Driving may be an example.

This means that the *division of our attention* is an ability of ours that shows how many different types of activities we are able to perform simultaneously. Attention range means how many different stimuli we are able to receive at a time, while its span how long we are able to focus on one thing uninterruptedly. Attention *transfer* means how easy or difficult it is to divert our attention from one thing to another. These characteristics of voluntary attention develop a lot as people age. [2]

Connection Between Learning Processes and Attention

The learning process does not only mean the acquisition of knowledge. We continuously learn during our lives: behavioural patterns, customs, and roles. However, this chapter of my study discusses the connections between learning at school and attention. Attention is a prerequisite of learning. Its capacity may be improved both in quality and quantity by concentrating, extending its length. This is why its development is important.

School work significantly contributes to the development of involuntary and voluntary attention. Pupils in their junior years slowly progress from spontaneous attention to the ability of consciously focused attention. As a result, the focus of attention lasts a short period of time initially, and can be diverted easily. The attention of first year pupils may be aroused with new and emotionally colourful stimuli at the beginning of the school year. The 5–7-year-old age group are capable of paying attention for 15 minutes on average at a time, 7–10-year-olds for 20 minutes. Because of these age characteristics, the lessons in the first years are planned in a way that small children have a chance to take a rest after 15–20 minutes, "wonder

[2] Tóth Ibolya (2001): *A pszichológia alapjai.* Pécs: Comenius.

[4] Oroszlány Péter (2005): *Tanulásmódszertan.* Budapest: Metódus-Tan Betéti Társaság.

off" so that they are able to pay attention again later. Activities done during the second and third lessons are the most effective from an educational point of view, since this is when the concentration of attention and span are the best. Later exhaustion appears after shorter periods, certainly showing big individual differences. Children in the first and second years are able to immerse themselves in certain activities so much that they forget about everything else. This phenomenon is the difficulty of transfer of attention, which gradually improves similarly to attention span. Dividing attention is also a difficult task. An example is the small child learning to read, who, first, is only able to concentrate on reading, but not the contents of the text. They do not yet understand what they are reading. [5]

Children's attention is certainly determined by the object of their attention, its attractiveness. If something interests a child, their attention is focused longer, more accurately, and becomes able to concentrate on the specific thing for a longer period. There is a close correlation between interest and attention. 7–10 years-old children are at the objective interest stage. It means that their objective is to get to know the world, would like to try real objects and not their copies made for children. They endeavour to gain objective experience, are interested in tools, instruments, nature and the activities they can perform on their own. Pupils in their junior years do not have favourite subjects, they are generally interested in all the areas. Differentiation in this field will take place on the basis of the successes and failures they experience.

The example of the family, parents' attitudes certainly also have a significant role. This is the age when success seeking or failure avoiding attitudes start taking shape as well. A clear sign of the systematization appearing in thinking is the collection of objects. Almost every little child collects something (napkins, stamps etc.). [5]

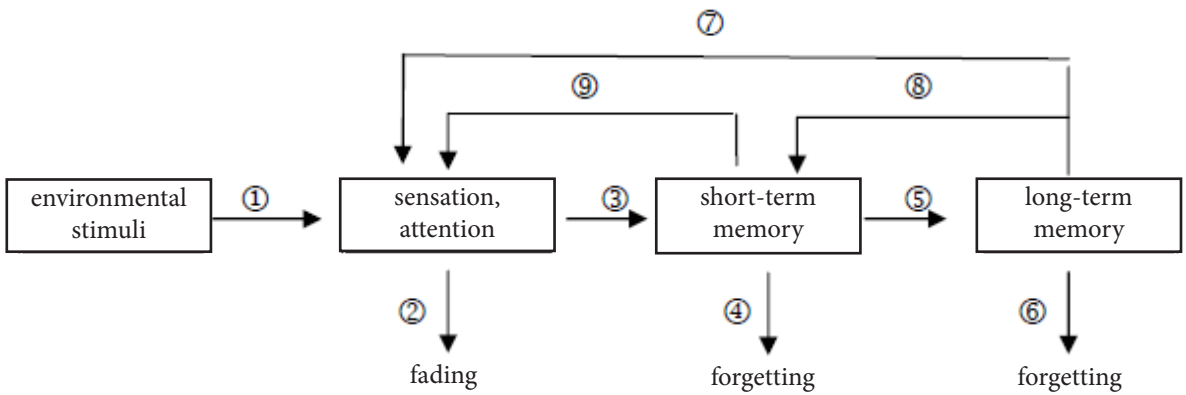
In addition to interest, remembering is also significant when the role of attention is examined in the learning processes. On the basis of the available special literature [6] learning – on the basis of cognitive psychology – is interpreted as information processing. The nervous system is considered an information processing system. Since the acquisition of information, knowledge is of outstanding importance in the course of school learning, I think it is important to discuss these views in this study. The authors of the work *Effective Learning* (A Hatékony tanulás) distinguish memory stores and

[5] Döbör Ágota (2008): *Amit a hallgatónak tudni illik a kisiskoláskorról.* Szeged: SZEK – Juhász Gyula Felsőoktatási kiadó.

[6] Gaskó Krisztina–Hajdú Erzsébet–Kálmán Orsolya–Lukács István–Nahalka István–Petriné Feyér Judit (2006): *Hatékony tanulás*. Budapest: ELTE PPK Neveléstudományi Intézet.

feedback functions in the learning process on the basis of the multi-store memory model attributed to Atkinson and Schiffrin. [6] (*see Figure 2*) This claims that information passes through several stages before we remember, learn it in the long term. As a first step, we need to sense the information, then our sensory system decides which part of the lot of incoming information is important to us from a learning point of view. This is the process of attention.

Figure 2. A possible model of learning as information processing.



Source: Gaskó Krisztina–Hajdú Erzsébet–Kálmán Orsolya–Lukács István–Nahalka István–Petriné Feyér Judit (2006): *Hatékony tanulás*. Budapest: ELTE PPK Neveléstudományi Intézet.

The information insignificant in a given situation (for example the noise of the street during learning) is processed at a lower level of perception, and then fade with time. Information gets into our short-term memory with the help of attention, where it is clustered into units. Depending on the individual, into 7±2 units in the case of adults. A part of these are only stored for up to 20 seconds, then sent over to the long-term memory store, other parts are forced out of the process. The information in the short-term memory can only be kept if we practice a method especially suitable for it, for example by systematising or repeating it. This is contrary to the attention stage, when information is automatically selected. More complicated processes take place in the long-term memory than in the first two memory stores. The employment of certain methods is necessary to store information. Its success depends on how it was coded, what methods were used to imprint the information, and we try to retrieve that information later. Systematisation is an

important factor, the development of thematic units, the association of key words. Repetitions are indispensable from the long-term memory point of view since our experience shows that the probability of remembering rapidly decreases with the time passed since committing it to memory. Special literature [6] distinguishes external and internal factors in the case of effective learning. The latter ones are described as follows:

– the learning individual's current condition
– self-assessment, ideas, attitudes related to learning
– motivational factors of learning
– "cognitive base"

The roles of attention and memory are decisive out of the cognitive abilities of learning. *"When developing our learning abilities, we most often endeavour to improve our memory, but is well known that attention can be considered an antechamber to memory, as a result all memory improving techniques have a positive effect on certain abilities of attention (e.g. ability of observation, ability of differentiation, ability of recognition), or builds on their higher level of operation from the start. It is advisable to do playful, entertaining tasks in order to develop memory and attention."* [6]

Attention Tests

Due to the several parameters of attention, the term "attention test" can only be interpreted as an umbrella term that includes the processes examining and measuring the functioning, certain characteristics of attention under specific conditions.

The special literature [1] divides attention tests, on the basis of their application, into the following big groups:

– Cross-out tests
– Processes requiring some continuous and repeated calculation
– Sorting methods
– Tests imitating a specific work task
– Assigning, comparing, so called code sign tests
– Processes measuring distributive (divided) attention

Cross out methods are one of the most widespread and oldest groups of attention tests. The creator of this type was B. Bourdon, who compiled a method in 1895 to measure attention concentration and fatigability, which meant that the examined

[1] Internal document of the Dunaújváros Branch Institute of the Pedagogical Services of Fejér County: Attention Test Instructions.

[6] Gaskó Krisztina –Hajdú Erzsébet– Kálmán Orsolya– Lukács István–Nahalka István–Petriné Feyér Judit (2006): *Hatékony tanulás.* Budapest: ELTE PPK Neveléstudományi Intézet.

person had to cancel four specified letters of a meaningful text. Bourdon's procedure measured the time spent doing one page, examined the inaccurate crossings-out and the mistakes arising from loss of concentration. A characteristic of it is that the number of its tasks was specified, but the amount of time given for any amount needed. The method has been modified in many ways, the version used today replaces the meaningful text with meaningless strings of letters.

Its improved version known in professional circles is connected to E. Toulouse and H. Piéron. The letters are replaced with abstract signs in the attention test created in 1911. Two versions are used in Hungary. Three types of signs have to be selected out of eight different signs in the so-called "big Piéron" test. The test is made up of a total of 2,550 signs in thirty lines. This can be applied from the age of 13-14. Its shorter version is suitable for measuring attention from the age of eight. This is why I used the latter test in my research. The fact that both versions of the Piéron test can be repeated after two months played an important role in my choice of method. The reason for it is that it does not contain specific memory units, and the indirect memories are usually obscured by the discrimination task. If the test is used again within a shorter period of time, the learning effect should be taken into account, and the standards cannot be used. The time devoted to development in this research is five weeks, so the procedure can be used. Other attention tests recommend a waiting period of six months.

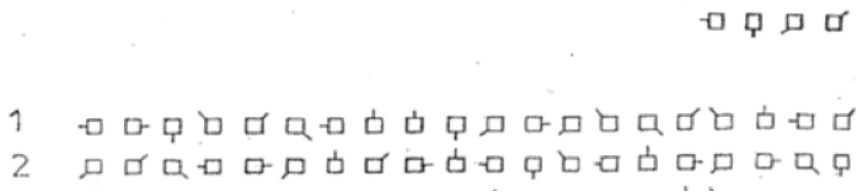
Structure of the Piéron Test

The Piéron test examines the ability of attention to concentrate in the course of the monotonous job of visual discrimination of simple abstract pictures. The test provides information about:
– the performance of attention concentration shown through the visual discrimination of signs
– quantitative performance of a task with "attention load"
– type of attention lapse (discrimination did not take place – omission, or discrimination was inaccurate – a miss)
– fatigability and the change in the quality of the performance as time passes in the case of more refined tests, and when it is needed (in which cases after every minute or other used time unit, instructions have to be given to mark progress – a vertical line has to be drawn on the test sheet after the sign being examined)
– tolerance of monotony appearing generally (and not in a measurable way) in the above described work activity [1]

As regards its type, it is a psychometric speed test. As regards interpretation: an objective, direct, simple procedure. As regards its administration: non-verbal (abstract-figurative), pencil-paper, fixed question-answer type test, applicable in groups as well.

The test sheet has a total of 400 signs in twenty lines. There are four separately marked signs above the sign matrix (see *Figure 3*). The task is to distinguish these separately marked signs from the others and mark them. The signs are squares with 4 mm sides with small lines sticking out of them. The only difference is that these little lines are placed on different parts of the squares. They may be in the middle of the upper or lower, left or right sides of the square (perpendicularly), or may diagonally stick out of any of the corners of the square. This makes the number of variations eight. These are the ones from among which the four signs have to be selected. Ten out of the twenty signs in each line are identical to the samples. The working time for the completion of the test is five minutes, before which specific instructions have to be given.

Figure 3. A part of the Piéron test.



Source: Own figure on the basis of the Piéron attention test

The first step of the assessment is to establish the discrimination performance. This means how many signs did the examined individual, the pupil could check during the five minutes they had at their disposal to do the discrimination task. The structure of the test helps establish it: the 20-sign-a-line structure does not require to count the performance one by one. In addition, a pattern helps the work of evaluators. There are two types of mistakes:

– failure to mark the signs identical to the samples (omissions)
– crossing out signs that are not identical to the signs in the sample (wrong markings)

In simple cases the two types of mistakes do not have to be separated but considered mistakes and added up.

Following it, the relative quality performance of attention concentration may be established expressed in relation to work performance. It is calculated on the basis of the following formula, in which:

– quality performance: n
– number of mistakes: H
– relative performance of concentration: T%

$$T\% = (n-H) * 100/ n \qquad (1)$$

Description of the Venue of the Research

The present building of the Hunyadi Mátyás Primary School and Elementary Arts School in Perkáta was opened in 1974. Beforehand the children of Perkáta studied in the Győry-Hunyadi Castle. It is the children of local residents who go to this 40-year-old institution, and most of the teachers are also locals. The number of pupils fluctuates between 320 and 340. The artistic nature mostly means music. The flute, piano and solfeggio are taught as required.

The institution has successfully used and utilised the competitions of the last few years. Several competitions aimed at improving the school building, the classroom equipment and the development of the tools used in teaching, while others aimed to help children spend their free time more usefully. The afternoon programmes were organised as club activities thus giving all the students the opportunity to participate in the ones they were interested in.

Free Time Development of the Attention of Pupils in Year Two

This chapter of my study presents the pedagogical experiment that I conducted in class 2.B of the Hunyadi Mátyás Primary School of Perkáta. Of the basic cognitive abilities making up the personality, I placed attention in the centre of my research. I used the Piéron test to measure attention after consultation with Ildikó Csák, a psychologist and teacher of handicapped children at the Dunaújváros Branch Institute of the Pedagogical Services of Fejér County. After the first measurement, every day for five weeks I performed activities with the children during their free time that I can perform as a teacher, and whose attention development effects are known. At the end of the experiment I measured the children's attention again using the above mentioned measurement tool. I will present the results of the surveyed age group compared to the standard values and to the first measurement, that is, to themselves as well.

Description of the Attention Development Activities

The duration of the experiment was five weeks. The number of students in the class was 18 pupils. Six of them girls, 12 boys. The first time I had the class do the Piéron test. The development took place daily during controlled free time with the help of activities taking up 30 minutes on average. Attention development was organised around four types of tasks identical in nature. My objective was to make the activities interesting to the children and suitable for the characteristics of the age group.

Through the use of tools available during routine teaching practice, the children did colourful tasks that offered them delightful experiences. The different games did not only improve their attention but, among others, strengthened children's social bonds or tolerance of monotony. These will also be mentioned in the description of the individual activities.

Initiated Games

The special literature [7] distinguishes between spontaneous, controlled and initiated games. As regards "game control" the task of the teacher is to ensure free, spontaneous games. In the case of children, the least possible amount of interference in the game activities is recommended in order to achieve children's competences. A characteristic of this attitude is the active, observing, non-interfering adult presence. The issue of controlling the game is still a matter of dispute – there are several different types of approaches and interpretations. The author points out that during controlled games the adult creates the conditions for development; controls the process formally or informally, but never in a direct way. This method interprets the game as a changing, developing activity that facilitates motivation and encourages the development of more advanced games full of content. Initiated games are between spontaneous and controlled games. The teacher invites the children to play, who may voluntarily join in the activity. In cases when a child needs special activities in an area, it is recommended to organise initiated games. This might be a skill development activity in a group or individually. [7]

On the basis of the above, initiated games constitute one of the development types in my pedagogical experiment. I organised common games for the surveyed class twice a week, on Mondays and Wednesdays, during their free time at school. I took pleasure in the fact that the children liked to participate in the game activities. I selected activities that included both already known and new games, ones that I taught them during the experiment.

Visual Attention Development – Development of Perceptibility

[7] Takács Bernadett (2001): *Gyermek – játék - terápia.* Budapest: OKKER.

Once a week, I conducted tasks also aimed at developing memory and concentration by using different tools. Visual attention development strengthens the reception of image stimuli. Visual attention has a significant role in the teaching-learning process at school. The children performed the tasks in pairs or in groups of four. A characteristic of this type is that the pupils can observe certain things for 30 seconds, then they have to reproduce them.

Memory Games

I included the memory games and paper-pencil games among the development activities upon the recommendation of Ildikó Csák, a psychologist and teacher of handicapped children at the Pedagogical Services of Fejér County. Memory games, which exist in countless variations, also offer a chance to develop attention. Visual perception, attention and visual memory all develop through them. The children played these task types once a week in small groups (of 4–5). Since they are seated at five desks in the classroom, I prepared five types of memory games for them. During the development, they had a different one every week. I considered variety important so that the children be interested in the games, wait curiously for the next time, and thus be motivated and not feel the activity was compulsory.

Paper-Pencil Tasks

Pupils come across paper-pencil tasks during their school careers countless times for the solution of which the ability of attention is indispensable. The activities included ones where they had to find small pictures on a big illustration, and ones in which they had to find certain signs, letters going from left to right in every line, and circle them. While the former activity practices the recognition of whole-part as well, the latter one can be solved by using the algorithm needed for the Piéron test as well, and increases the tolerance of monotony.

Descriptive Data

I continue with the description of the attention performance of the surveyed class, that is, present the results of the Piéron tests before and after the development activities. I compared the pupils' performance to the standard levels and to themselves. I separately analysed the quantitative results achieved in the test,

and the relative qualitative performance of attention concentration. I entered the results in a SPSS computer data processing system, then analysed them.

The gender distribution of the sample was the following: 6 pupils or 33% girls, 12 pupils or 67% boys.

On the basis of the results of the first Piéron test, the lowest quantitative performance was 44 elements, while the highest 216. The pupils did the discrimination task on 128 elements on average. The relative quality performance of attention concentration was distributed between 65.06% and 100%. The surveyed group achieved an average result of 93.62%.

The following compares the performance of the surveyed pupils to the standard values,[1] which is shown in the table below. (*see Tables 1 and 2*)

[1] Internal document of the Dunaújváros Branch Institute of the Pedagogical Services of Fejér County: Attention Test Instructions.

Table 1. Qualitative performance level categories (n).

	well below average	below average	average	above average	well above average
Primary school pupils	**–158**	**159–200**	**201–295**	**296–375**	**376–**

Source: Internal document of the Dunaújváros Branch Institute of the Pedagogical Services of Fejér County: Attention test kit instructions

Table 2. Standard levels of relative quality performance of attention concentration (T%).

	well below average	below average	average	above average	well above average
Primary school pupils	**–90,3**	**90,4–95,7**	**95,8–98,5**	**98,6–99,4**	**99,5–**

Source: Internal document of the Dunaújváros Branch Institute of the Pedagogical Services of Fejér County: Attention test kit instructions

It can be stated about the comparison of the number of elements examined by the pupils compared to the standard levels that the majority, 89% of the pupils, performed well below the average. This means that they were able to check fewer than 158 elements during the five minutes they had. Only 1–1 pupil, 6–6% of test writers performed the discrimination task at below average or average levels. None of the pupils was able to check more than 295 elements.

It can be stated about the comparison of the relative quality performance of attention concentration compared to the standard levels that most pupils, 33% of the sample, performed below average, that is, their T% index was between 90.4% and 95,7%. Similar proportions, 22%–22%, achieved average and well above average results. Seventeen per cent of pupils performed well below average, while 6% above average.

The quantitative performance results of the second survey conducted at the closing of the pedagogical research showed that the slowest pupil examined 74 elements on the test sheet, while the best one 250 elements. The average number the task was performed on was 163. This result is 27% better than the average before the development was started. The relative performance of attention also shows improvement compared to the first survey. The T% value of the weakest pupil was 82.43%, the best ones achieved 100% again. An increase from 93.62% to 95.31% can be seen in average performance. On the whole it can be stated that the pupils' performance was higher during the second Piéron test.

When compared to the standard levels, the results of the closing survey are the following: 39-39% of the pupils examined a number of elements well below or below average, the performance of 22% of them was average.

As regards the level of relative performance of attention concentration, 28%–28% performed below average and well above average respectively. Twenty-two per cent of the pupils performed at an average level, while 17% well below average. One pupil achieved an above average T% index.

Examination, Analysis of the Hypotheses

I suggested the following hypotheses during the pedagogical experiment:
1. The relative quality performance of pupils' concentration will clearly improve as a result of attention development activities. (T%)
2. Pupils' performance measured with the Piéron test will significantly improve as a result of attention development. (n)

The following chapter examines the validity of these hypotheses using correlation calculations. Pupils' absences did not influence their performance during the five weeks of the experiment. No differences on the basis of gender can be found in the sample either. I conducted the analysis for these factors as well, and no significant correlation of any kind can be found.

Hypothesis 1

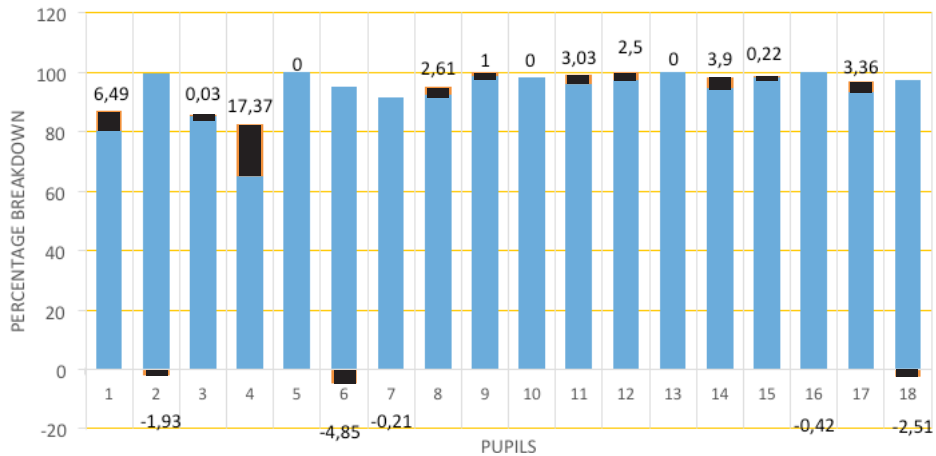
The relative quality performance of pupils' concentration will clearly improve as a result of attention development activities. (T%)

On the basis of the research, the relative performance values of pupils' attention concentration (T%) show a strong significant (r=0,885 p=0) correlation between the first and second surveys. With a 99% probability thus it is not a coincidence that the correlation coefficient is 0.885.

It can be established with the use of correlation calculations that the relative performance values of pupils' attention concentration compared to the standard levels have a strong significant correlation with each other on the basis of the surveys conducted with the first and second Piéron tests. The correlation coefficient is 0.829.

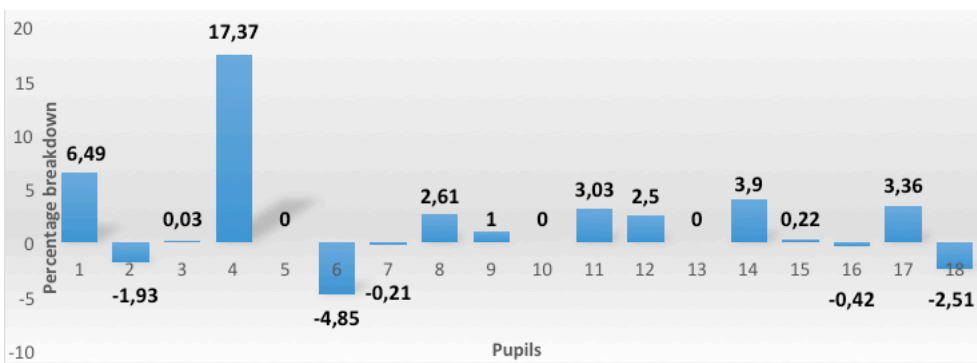
The T% values increased in the case of most pupils, 72.3% of them, as a result of their participation in the development activities. On the basis of the survey conducted at the closing of the five-week experiment, all except five pupils' attention concentration improved. Three pupils performed at the maximum level both at the first and second surveys, they had no mistakes in the discrimination task. (*see Figure 4*)

Figure 4. Development of the relative performance of attention concentration considering the results of the two tests.



The level value categories of the relative performance of attention concentration show a lot lower level of dispersion than the level values of quantitative performance. I present the changes in the T% values for the individual pupils in a separate chart to facilitate easier interpretation. (*See Figure 5*)

Figure 5. Changes in the T% values of the individual pupils as a result of the development.



The correlation coefficients of attention performance measured with the Piéron test show strong, significant correlation both when the pupils are compared to themselves (r=0,885 p=0) and to the standard values (r=0,829 and p=0). The relative performance of attention concentration clearly improved as a result of the attention development activities. This means that Hypothesis 1 is substantiated.

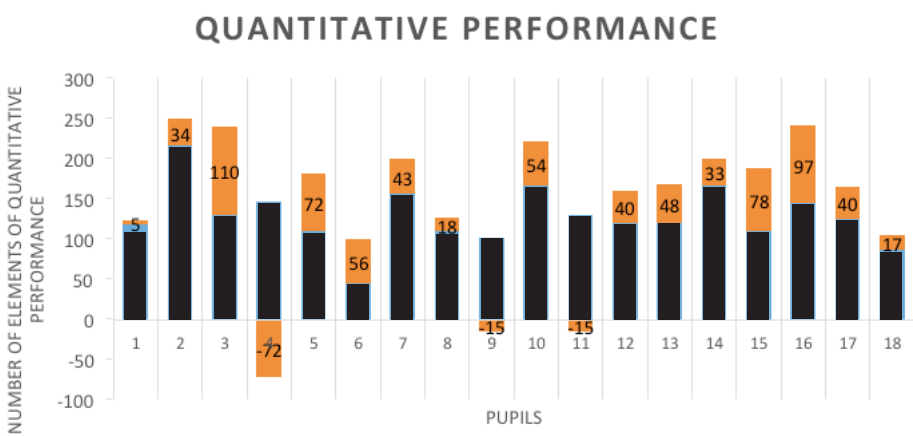
Hypothesis 2

Pupils' performance measured with the Piéron test will significantly improve as a result of attention development. (n)

On the basis of the conducted research it can be stated that there is a strong, significant correlation between the values of quantitative performance as regards the first and second tests. There is a 99% probability that the 0.635 value of the correlation coefficient is not accidental.

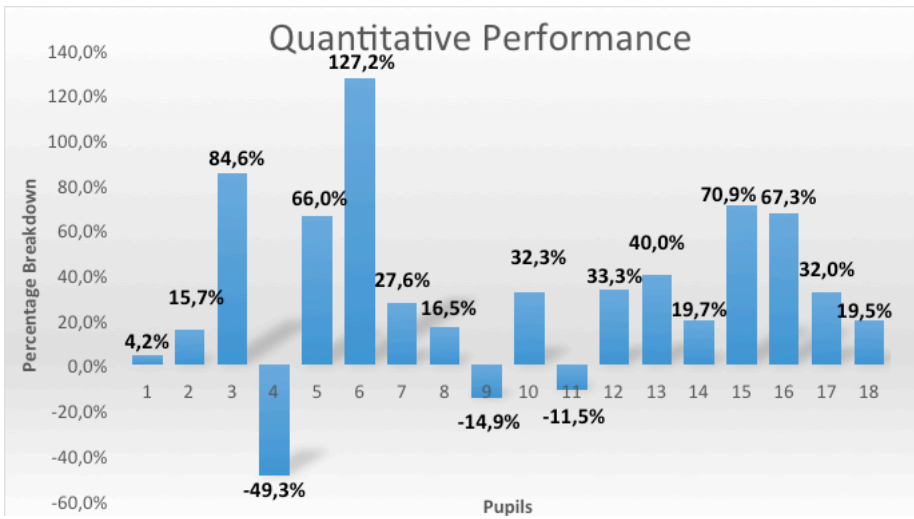
On the basis of *Figure 6*, the majority of pupils performed the discrimination task faster, that is, was able to examine more elements during the given time than on the first occasion. There are only three pupils in the whole sample whose performance did not improve compared to the results of the first test.

Figure 6. Development of pupils' quantitative performance as regards number of elements.



When expressed as percentage the qualitative performances of the individual pupils were as follows (*see Figure 7*).

Figure 7. Percentage breakdown of the changes in quantitative performance.



Pupils' performance measured with the Piéron test showed strong, significant improvement as a result of the attention development activities. On average they achieved 27.3% better results compared to the first test. This means that Hypothesis 2 is substantiated.

Summary

The study presented the activities that I conducted for the development of attention as a basic ability in a class in year two during their controlled free time activities. I made every effort to provide the same conditions, circumstances for the surveys. Since the concentration of attention and span are the best during the second and third lessons ,[5] the pupils did the Piéron tests at the beginning of the second lesson on Mondays in both cases. This procedure may be employed from the age of eight

[5] Döbör Ágota (2008): *Amit a hallgatónak tudni illik a kisiskoláskorról.* Szeged: SZEK – Juhász Gyula Felsőoktatási kiadó.

to measure the relative quality performance of attention-concentration. The standard level values used in my work are valid for all the primary school years. This wide age range may be the reason why the children's quantitative performance showed values well below average, and they did not achieve above average results even after the development. However, their individual performances, when compared to themselves, significantly improved. It can be stated that the attention span of the majority of children increased due to the development activities, which is proved by the positive changes in their quantitative performance. The T% values, that is, the relative quality performance of attention-concentration showed improvement in the case of fewer children. There were some who performed the same way, or worse during the second test. These results cannot be considered relevant since attention depends on the emotional state, the workload of the children, their weariness. Since attention is easily distracted, the performance achieved during the five minutes available for them may vary by individual and occasion. In addition, we should consider the fact that the development of abilities is a long process, the five-week cycle had less effect on some pupils. All in all, the process of attention development started in the case of these pupils, and produced spectacular results in several cases.

I suggested two hypotheses, which were substantiated with the help of correlation calculations. The results of the first measurement conducted with the Piéron attention test first, and those of the second conducted at the closing of the development stage justified my hypotheses that both the qualitative performance of pupils' attention concentration and their quantitative indicators improved in the case of the majority of the children as a result of the playful development activities.

I would like to use my work to draw attention to the fact that it is possible to organise useful free time activities and ensure a set of conditions suitable for the development of abilities within the safe environment of schools. We certainly develop the abilities of those who attend our classes if it is possible within the framework of the given subject. However, with the expectations increasing there is less and less time for development activities at lessons. The abilities that play a role in learning vary a lot by individual. Regardless of our inborn capacities, all our abilities can be developed. However, this is a long process. Several activities that create a sense of community, develop abilities can be performed within the framework of controlled free time in a playful manner that considers children's age characteristics and help their personality to improve. At the same time, we maintain the activity's leisurely nature: "Free time is free time if children live it as free, if it is not stressful, not restricted and there is no pressure of performance." [8]

[8] Kovács Katalin (2011): A gyermekek szabadidős tevékenységének alakulása a lakóhely függvényében. In: *Iskolakultúra*. 2–3.

ILDIKÓ MESTERHÁZY-VAS *

Examination of modular vocational training on the basis of a specific occupation

Abstract: It has been nearly ten years that the system of secondary vocational education and training was changed in Hungary in 2006. A modular training system was introduced along with a set of comprehensive vocational and examination requirements.

The transition was not simple and smooth for schools. It was received in different ways by those participating in the training. The system was continuously transformed, and reached its present form in 2012. My research sought an answer to the question whether the renewed competence-based modular training fulfils the role expected of it nowadays, whether the graduates possess the competences required for the given occupation. I have reviewed the vocational education and training systems from the years following the democratic transformation as well as their legal background. I discussed the essence, structure of competence-based modular vocational education and training.

I analysed the development of the training structure and lesson plans of a basic occupation and a partial qualification course. I did research on the opinions about the modular training form among vocational teachers and instructors working in the school system. I used the questionnaire method for my research. All in all, it can be stated that the modular training system introduced nearly ten years ago poses a lot of questions even today. It is not uniformly accepted and known by those who work in training.

Cooperation from the participants and continuous development are needed in order to achieve the objectives of secondary level vocational education and training.

Keywords: Modular training system, complex examination requirement.

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Összefoglalás: Közel tíz éve, hogy 2006-ban hazánkban megváltozott a középfokú szakképzés rendszere. Bevezetésre került a moduláris szerkezetű képzési rendszer és hozzá egy összetett szakmai vizsgakövetelmény. Az átállás az iskolák számára nem volt egyszerű és zökkenőmentes.
A képzésben résztvevők is eltérően fogadták. A rendszer folyamatosan átalakult, jelenlegi formáját 2012-ben nyerte el. Munkám során arra kerestem a választ, hogy a megújult kompetencia alapú moduláris képzés betölti-e elvárt szerepét napjainkban, a végzett tanulók rendelkeznek-e az adott szakmához szükséges kompetenciákkal.
Áttekintettem a rendszerváltoztatás utáni évektől a szakképzési rendszereket és ezek törvényi hátterét. Foglalkoztam a kompetencia alapú moduláris szakképzés lényegével, felépítésével. Elemeztem egy alapszakma és egy rész-szakképesítés képzési struktúrájának, óraterveinek alakulását. Kutatást végeztem a moduláris képzési forma megítéléséről az iskolarendszerben dolgozó szakmai tanárok és oktatók körében. Kutatásomhoz kérdőíves módszert használtam. Összességében megállapíthatjuk, hogy a közel tíz éve bevezetett moduláris képzési rendszer még napjainkban is sok kérdést vet fel.
A képzésben dolgozók körében nem egységesen elfogadott és ismert. A középfokú szakképzés céljainak megvalósulása érdekében a résztvevők együttműködésére, az egységes gondolkodásra, a folyamatos fejlesztésekre és fejlődésre van szükség.
Kulcsszavak: Moduláris szerkezetű képzési rendszer, összetett szakmai vizsgakövetelmény.

Introduction

A lot of changes have taken place in Hungarian vocational education and training in the last decades. The innovations, modifications were always performed with good intentions so that the young people leaving the vocational training could have modern, up-to-date and marketable knowledge.

It has been nearly ten years that modular vocational education and training was introduced in Hungary using Western European models. Is this the right path? Was its introduction necessary, or are there other possibilities?

These are the questions I seek answers to in my paper. I used the questionnaire method to gather information.

I wished to find arguments for the usability of modular vocational education and training, summarise the possible improvements, modifications on the basis of the opinions, and reinforce the right elements.

Changes in the vocational Education and Training Structure

The length of training for skilled workers could be two or three years before 1997, the training was based on 8 years of elementary school.

With the implementation of the 1993 acts on public education and vocational training, a new structure appeared in vocational education and training: the 2+3-year, and in the case of some occupations the 2+2-year training. Those who chose vocational education and training could enter a two-stage training system after finishing their eight years of elementary school studies. The first stage is the years 9–10, where orientation training with occupation groups is done. Great emphasis is placed on general subjects, and language and communication training as well as information technology are dominant within it. Sciences have an outstanding role, teaching methods that offer problem solving and thorough knowledge. A new element is the introduction of career counselling. Students take professional preparatory courses during this stage. [1]

The competence-based modular vocational education and training was introduced from 2006 on. Complex final exams were replaced by modular exams, the training may be done through modules, but subjects may also be used.

The duration of vocational education and training was reduced to two years in 2010. The act of 2011 on public education states vocational education and training based on elementary education is 3 years long, while the 2-year-long vocational education and training is based on a successfully completed year 10 or completed secondary education (vocational qualification not belonging to the secondary vocational school branch). [2]

Table 1 summarises the changes that have taken place in the structure of vocational education and training in the last 20 years.

[1] Benedek András (2003): *Változó szakképzés.* Budapest: Okker.

[2] Bihall Tamás (2011): A modern három éves szakmunkásképzés bevezetése Magyarországon. In: *Szakképzési Szemle.*

Table 1. Changes in vocational education and training structures in Hungarian vocational education and training.

	Duration of Training	Final Exam	Training
up to 1997	3 years (based on 8 years of elementary)	complex	subject-based
from 1995–98	2+3 years	complex	subject-based
from 2006	2+3 years	modular	modular or subject-based
from 2010	2+2 years	modular	modular or subject-based
from 2011	2+2 years 3 years based on 8 years of elementary	modular	modular or subject-based
from 2013	3 years 2 years based on year 10	complex	modular

Content Regulation of Vocational Education and Training

The parliament passed the first law on vocational education and training after the democratic changes in 1993. (Act LXXVI of 1993 on vocational education and training)

The law sets up a uniform framework for school-type vocational education and training, and creates a new base for the Hungarian vocational structure, creates guidelines for the qualifications register and a uniform national set of requirements.

The law was modified several times, and a new vocational education and training act was drawn up and passed by parliament in 2011. (Act CLXXXVII of 2011 on vocational education and training)

The most important change of the new law on vocational education and training is that secondary vocational schools (szakközépiskola iskola) and vocational schools (szakiskola) together are VET (Vocational Education and Training) schools. The government subsidizes only the first state-approved vocational programme. The government and special government departments (agriculture) appear as maintainers. Training is performed on the basis of a centralised skeleton curriculum and ends with a complex vocational examination.

National Register of Vocational Qualifications

The National Register of Vocational Qualifications (OKJ) was first published in 1993. It lists the vocational qualifications approved by the government. The qualifications included in OKJ can be obtained everywhere in the country on the basis of a uniform set of requirements.

The first edition of OKJ has been continuously updated, revised, and its results are built into the system through decrees.

The reform of vocational education and training had been prepared by 2006, which introduced modular vocational education and training in Hungary as well, and a new OKJ was published on the basis of it. In the OKJ published in 1993, there was no connection between vocational qualification types, which would have allowed the different occupations to be built on each other or on a common basis, so it was not possible to take previous training into account. Economic development required new occupations, but the system could not flexibly adapt to these needs. Vocational education and training found the answer in the form of a modular system. They recognised a system of vocational education and training with a common basis was needed as well as the fact that the vocational training types be built on each other, and that the introduction of partial qualifications was justified.

The OKJ published in 2006 and the professional and exam requirements attached to it present an occupation structure that is better and clearer and is in accordance with the economic and labour market needs.[3]

The OKJ published in 2012 includes independent occupations with separate occupational numbers. The subtypes, built-on qualifications were included as separate occupations.

[3] Vámosi Tamás (2011): *Képzés. tudás, munka.* Budapest: ÚMK.

Table 2. Development of the number of qualifications on the basis of OKJ.

OKJ (nr/year)	Number of Occupations	Number of qualifications
7/1993	955	955
37/2003	801	801
1/2006	421	1345
133/2010	424	1603
150/2012	486+147 partial qualifications	633

Competence-based Modular Vocational Education and Training

Competences

A competence is the ability with the help of which a task can be successfully solved, which ensures quick and efficient adaptation to changes for the individual.

An employee need to have the following competences in order to fulfil a specific job:

– professional competences
– personal competences
– social competences
– methodological competences

Characteristics of competence-based training:

– training is based on performance
– instruction is student-centred
– teacher is present as a helper
– instant student feedback
– facilitates individual progress
– assessment is done through measuring competences

Expectations of students are the acquisition of modern professional, information technology, foreign language competences at skill level and an increase in their practical knowledge, expertise, skills.
The competences to be acquired when learning a profession are included in the professional and examination requirements from 2006 on. [3]

Modular System

One of the basic principles of the OKJ published in 2006 was modularity.

It was the new requirements of the quality of labour that made the development of the modular system necessary. Knowledge that can perform came into prominence. The vocational education and training system was not able to follow the needs of the economy any longer, as a result dissatisfaction with the quality of vocational education and training was growing, and the attraction of vocational education and training continuously declined. [4] Graduates showed inadequate practical, professional knowledge. The Interchangeability between the occupations was not ensured, it was not possible to take previous knowledge into account. The structure of secondary training had to be transformed in a way that made training time shorter and education more effective.

In modular training, students acquire the competences needed for their qualifications through subject matter units. Competences, characteristics are determined in requirement modules, which may be of professional, social, methodological and personal nature. The modules include the entry level and the final objective that has to be achieved. It includes the educational, learning methods, tools and the criteria for assessment. Every module takes students to a predefined level.

An advantage of the modular system is that it makes it possible to quickly and flexibly follow the changes taking place in the economy. The contents of vocational education and training can be modernised more quickly and efficiently. [5]

[3] Vámosi Tamás (2011): *Képzés. tudás, munka.* Budapest: ÚMK.

[4] Madarász Sándor (2009): A szakképzés megújításáról. In: *Szakképzési Szemle.*

[5] Gubán Gyula–Kadocsa László (2007): *Szakképzés Magyarországon.* Budapest: NSZFI.

Analysis of the Joiner, and Joiner Assembler Partial Qualifications within Modular Vocational Education and Training

Analysis of the Lesson Plans of the Cabinet-maker and Joiner Occupations

I performed the analysis of vocational education and training built on year 10 without general education subjects on the basis of the lesson plans, pedagogical programme of a specific school.
The research is about the modular training used since 2008.

Chart 1. Development of the number of vocational lessons.

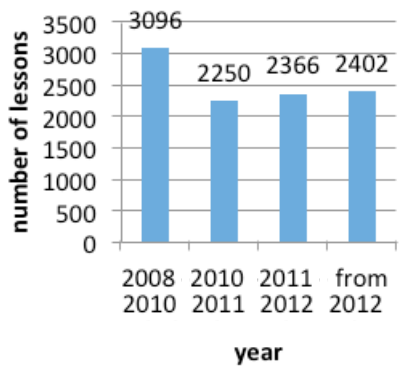
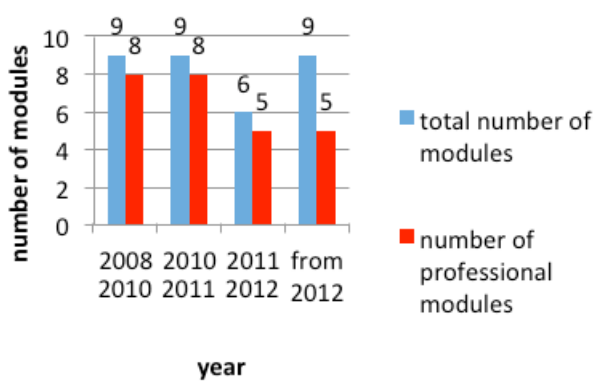


Chart 2. Development of module numbers.



The number of lessons decreased by 28% from 2010 on. (*Chart 1*). The decrease in the training time was explained by the fact that on the basis of experience from the last decades, 2,400 lessons are enough to acquire the given occupation. (Note: the three-year training was introduced to reduce career-starter unemployment in the mid-1990s. This measure was not advantageous from a national economic point of view since an expensive training type was maintained. It required significant extra expenditure from local governments.)

The development of the number of modules (*Chart 2*) reflects the vocational development from 2008 on. One out of the nine starting modules is about general education subjects. The modular structure introduced in the year 2011 made the modules more compact, and developed a better, more clearly arranged system. The training included six modules, one of which is the former general education subjects.

The skills and abilities expected of skilled workers justified the increase in the basic modules, as a result, the module system started in 2012 was added three further modules. Employment I, Employment II, Workplace health and safety. This took the system to a level which complies with competence-based training.

Analysis of the Lesson Plans of the Joiner Assembler Partial Qualification

Partial qualifications became part of modular vocational training.

The joiner assembler occupation first appears as a part of the cabinet-maker partial qualification, then as an independent partial qualification. The training is of modular nature.

The research was performed at the Arany János Nursery School, Primary School, Special Vocational School and Integrated Institution for the Education of Handicapped Children of Székesfehérvár, where I work in this area.

Analysis of the lesson plans of the 2008 and the new modular training.

Chart 3. Development of professional lessons during the whole training.

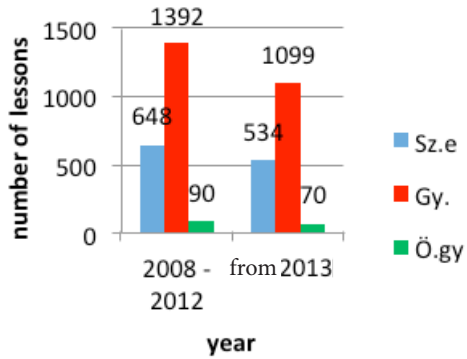
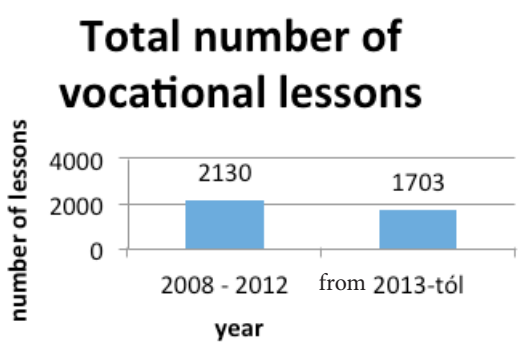


Chart 4. Total number of professional lessons.



When the charts are examined, a significant fall in the number of lessons can be seen. The number of vocational lessons fell by 427 lessons (*Chart 4*), that of general lessons by 114, and practical lessons by 313 (*Chart 3*). Are partial qualifications taught in the right number of lessons? When seeking answers to this question, the following may be considered.

The objective of the training is to develop a competence usable within a specific occupation so that students are able to perform independent or guided tasks in practice.

The decrease in the duration of the training period requires a more intensive and integrated type of education both in theory and practice.

The system requires teachers to use a complex vocational approach. Training connected to subjects should be abandoned, instead, the skills and abilities based on the requirements of the occupation should be emphasised.

The decrease in the number of lessons may be compensated by using fewer teachers in the training, but they spend more time with the group. They solve complex professional tasks during the training, in the course of which students' individual, social and professional competences are developed.

Analysis of Modular Vocational Education and Training among Participants of School System Education

I used an 18-question questionnaire during the research. I performed the research among people participating in vocational education and training. The questionnaire included three groups.

I. Personal background of vocational education and training.

II. Knowledge of the modular training system.

III. Suitability of the curriculum of the modules.

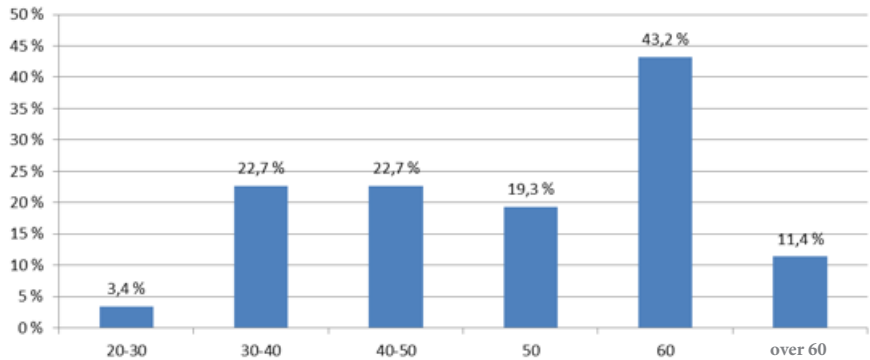
When selecting the sample, I considered it a basic principle that the proportions of respondents from the theoretical and practical fields should be roughly the same, and they should come from different professional branches of Fejér County.

The 93 returned questionnaires form the basis of my evaluation, which is a high enough number to obtain a realistic picture of the opinions about modular training.

Personal Background of Research

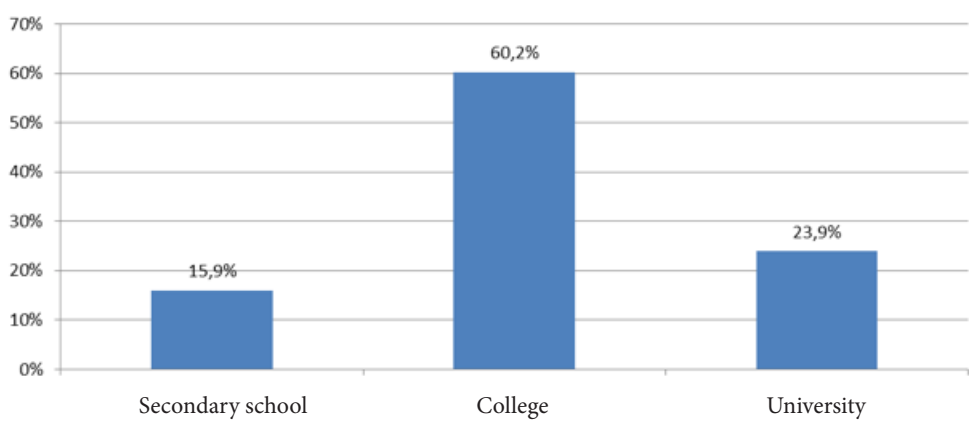
Respondents work in the theoretical and practical fields of vocational training. The average age of the respondents is 51 years.

Chart 5. Age distribution of respondents, %.



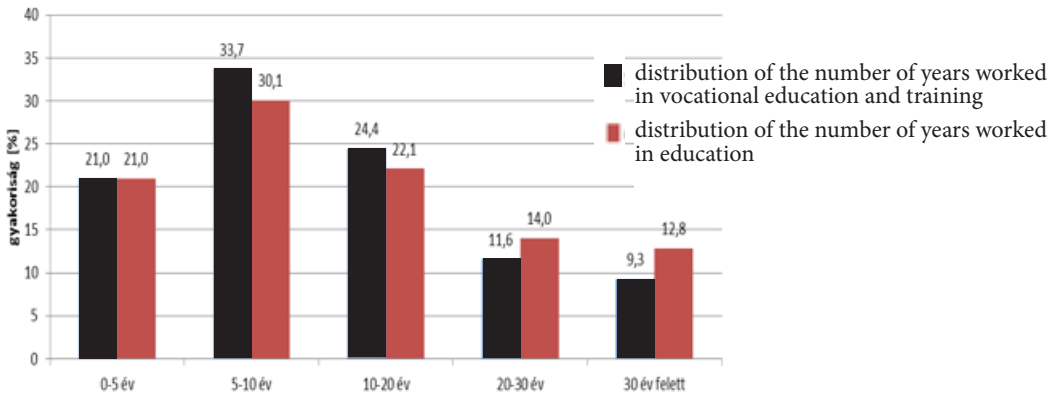
The age group 50–60 stands out with their 43.2% value. The career-starter age group makes up only 3.4%. (*Chart 5*) This shows that a significant proportion of those participating in vocational education and training will reach retirement age in the next 5–10 years, and leave the system. Career-starters do not choose vocational education and training, which can only partly be explained by the required practice (five years of professional experience), it is rather the (financial and professional) opportunities in the competitive sector that explain it.

Chart 6. Highest level of education.



60.2% of respondents have a college, 23.9% a university degree. 15.9% of respondents perform teaching tasks with a secondary level of education in the field of practical training. (*Chart 6*)

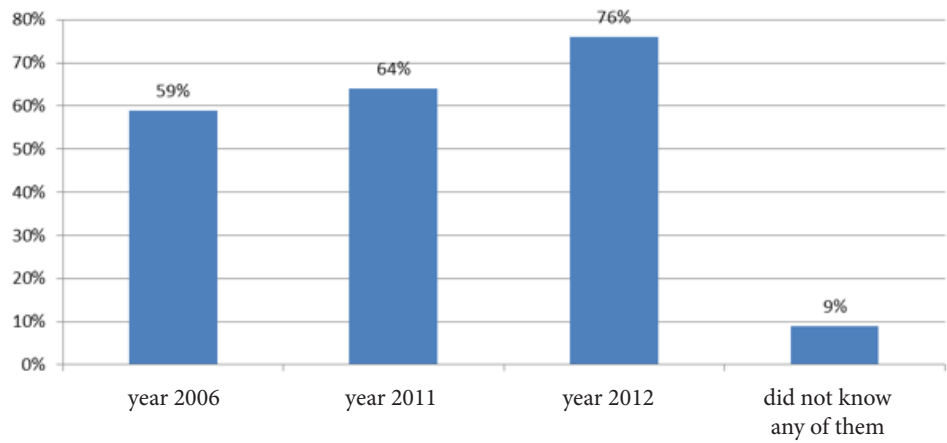
Chart 7. Number of years work in vocational training and education.



The number of years worked in education and vocational education and training shows that half of respondents entered education within the last decade. (*Chart 7*) When this is compared to their age, it can be found that a significant proportion of those aged around fifty who left the competitive sector due to the economic crisis found employment in education. This phenomenon means the participants of vocational education and training are growing old. Its positive side is that it is an experienced stratum with a high level of professional knowledge, which may significantly raise the standards of vocational education and training.

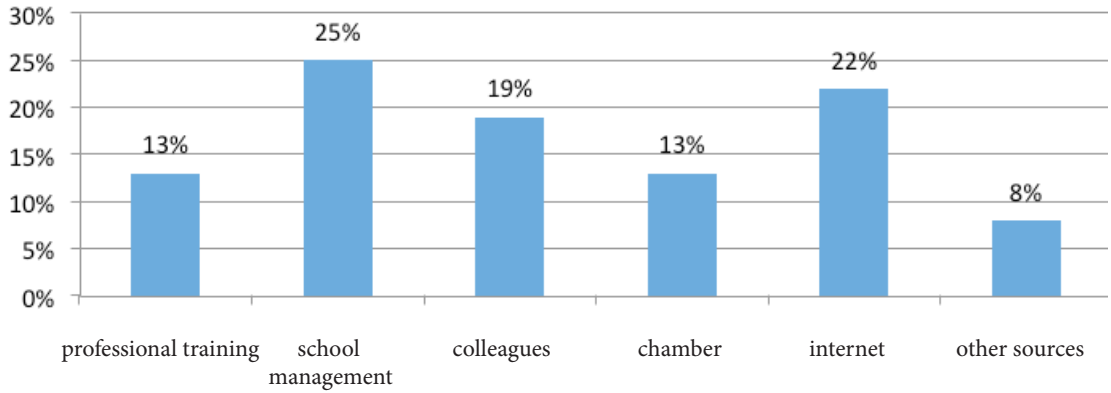
Professional Experience of Modular Training

Chart 8. Knowledge of modular programmes.



When the knowledge of central programmes is examined, we find that its knowledge is increasing (*Chart 8*). It is 100% knowledge that should be expected. It poses question that 9% of respondents are not aware of them. How do they perform their everyday tasks? This should definitely be improved. It should be a basic requirement of people working in vocational education and training that they know the central programmes. Responsibility and care for the occupation should be strengthened and placed in the focus of schools' vocational education and training activities.

Chart 9. Sources of information for the participants of vocational training.



Of the informal channels, 25% of respondents receive information from the school management, and the internet has almost the same proportion. Few people go to or participate in training sessions, and the role of chambers is also little in school system type of training. (*Chart 9*)

Analysis of Module Related Information

Chart 10. Contents of modules cover the vocational curriculum.

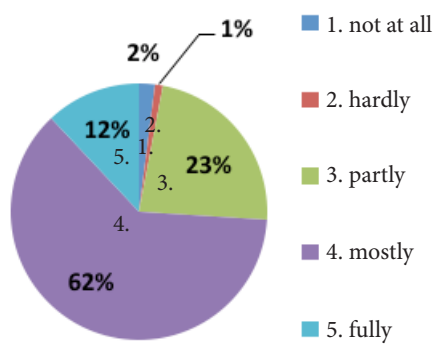
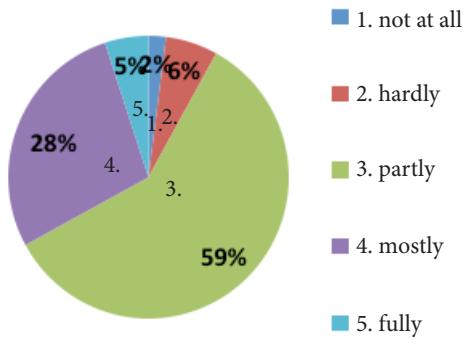


Chart 11. Modules can be taught well.



The vocational contents of modules are suitable. Seventy-four per cent consider them good, 23% partly good. The proportion of negative opinions is insignificant (1–2%). (Chart 10)

Opinions are slightly more negative as regards the teachability of the modules. Thirty-three per cent of respondents consider it good, and almost 59% only partly teachable. (Chart 11) The proportion of negative opinions has increased. The programmes are very general and there are frequent repetitions.

Chart 12. The modules are built on each other.

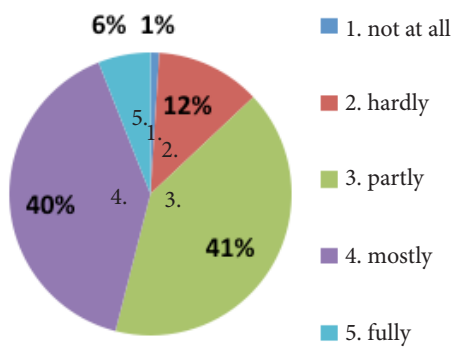
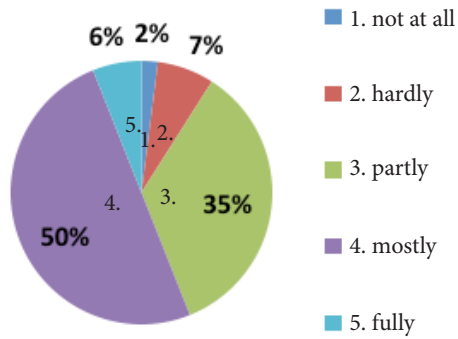


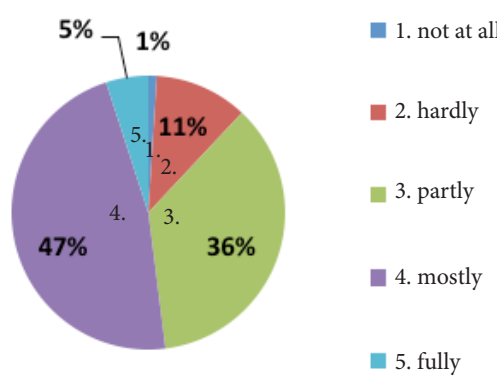
Chart 13. The contents of the different modules are precise.



The way the modules are built on each other was considered suitable. (*Chart 12*) Opinions show only a minimal number of negative answers. The over one third proportion of partly answers means that the modules are not separated, or it is difficult to separate them into modules.

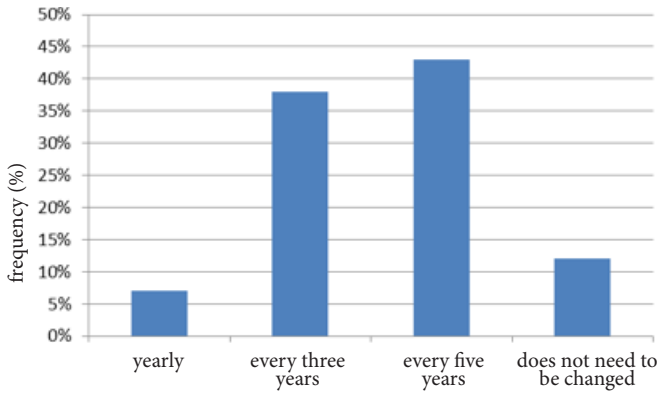
The contents of the modules are mostly suitable. (*Chart 13*) The results are similar to those of the previous question, which is explained by the connection between them. Opinions have proved that the system of subject contents and modules being built on each other is correct.

Chart 14. Contents of the modular system and its set of requirements are modern.



As regards the up-to-datedness of the contents of the modular system and its set of requirements, 36% of respondents consider it partly modern, and 52% modern. (*Chart 14*) The results suggest the overall rating is suitable. The contents and up-to-datedness meet today's requirements.

Chart 15. Frequency of changing the subject material in the modules.



There is need to update the subject material, and a frequency of 3–5 years is suggested. (*Chart 15*) This can be adjusted to the training period and the rate of professional development. There is time to use it, at the same time it ensures continuous and fast paced development.

Thirty-one per cent of respondents considered the 2006 introduction of the modular training, which pushed vocational training towards modernisation, good, however, 48% not good. Twenty-one per cent of respondents did not answer. A significant part of them did not work in education back then yet, so they could not answer this question objectively.

Those who answered yes mentioned the interchangeability, structure of training, the fact they are built on each other, the contents, the teachability, the chance of differentiated teaching, the new contents of the vocational and exam requirements, skill levels as their reasons. It is a milestone in Hungarian vocational education and training that occupations have been placed in a system, training has been divided into stages, the parts are built on each other and branch off, and partial qualifications have been introduced.

The reasons emphasised in the explanation to the no answers were bad implementation, overcomplexity, lack of conditions, inflexibility of the school system, and the fact that the requirements cannot be met.

The answers show that the no answers are not against the modular system but were formed on the basis of the implementation. Modernisation is needed, but a type that is based on the Hungarian education

system, is continuously developed and modernised. The modular system is a foreign body in Hungarian education. Basic shortcomings can be seen. There are no textbooks for the modules, no proper funds for the training. The practical modules cannot be completed in the competitive sector. Complicated exams with unrealistic results. Preparation is centred on the exams.

The 2011 and 2012 systems brought about significant changes in the modular training in the field of industrial occupations. Sixty per cent of respondents considered the changes of 2011, and 50% those of 2012 justified. The 2011 programmes are in their final year presently. Those of 2012 in their first entry year. Schools developed the programmes of 2011 in their local pedagogical programmes, while a central core curriculum was prepared for 2012. This explains the better awareness of the 2011 programmes. The 2012 programme added to the changes implemented in 2011. There were no changes in the number and contents of the vocational modules, only career counselling modules were inserted into the system. I think the changes of 2012 were very important and necessary.

Fifty-six per cent of respondents consider that the professional competences of the candidates can be partly assessed at the final examination, while 28% think they can be mostly assessed. Eleven per cent think they can hardly or not at all be assessed, while 5% think they can be fully assessed. The reasons mentioned confirm that students possess the necessary competences to successfully pass the final examination. In order for the professional competences to develop at a higher level, practice during the period after the training is necessary. It is important that career-starters find a job and obtain the professional competences related to their occupation as well as the personal and social ones. The chances of young people with partial qualifications and struggling with different difficulties and their social acceptance should also be mentioned. Their situations are not easy, a few remarked.

When answering the last question about how well the modular training meets the expectations of the economy in the case of the young people finishing the courses, a quarter of respondents said well, another quarter acceptably, and yet another quarter said no. Twenty-seven per cent did not answer it.
It can be established that 50% have positive opinions about the modular system, which is also suggested by the previous answers, since the awareness of the system and its acceptance also showed similar results.

Conclusions

The modular training was introduced in Hungary nearly a decade ago. The professional and examination requirements published in the first year were incomplete and inaccurate in many ways, and weren't harmonised with several of the decrees. For example, the cabinet maker occupation consisted of 13 modules, but the certificate issued by the Ministry of Education had space to register nine modules only. These mistakes were rectified within two years. The first final examinations in the school system were

organised within the proper legal framework. My research shows the reception of the modular training was mixed. Some schools developed a modular system, while others kept the subject system for their training.

Schools build a medium-term pedagogical structure in their pedagogical programme on the system of occupations that need the same foundations. Participants of the training also consider these opportunities advantageous and use them.

The modular training renewed vocational education and training, and had become an accepted and working system by the end of the first decade of the 21st century. My research shows that a third of those working in vocational education and training at schools considered it good, and its acceptance only rose after the changes of 2011/2012. This can be explained by the not suitable communication of its introduction, and by the fact that significant personnel changes took place in education during these years. A half of respondents entered education that year. It is essential to know the system and its contents to perform the daily tasks properly, yet this is not what we can see. They teach from routine. The professional pedagogical workshops are missing.

I find local and higher level training sessions, interschool cooperation of professional teams, care of occupations at a national level necessary. The pedagogical training of practical trainers should be improved.

The relationships between the chambers of industry responsible for the training and the schools are at a low level. Professionalism should be improved in this relationship, which would entail significant tasks on the chambers' part.

Training programmes are developed by smaller professional teams at local levels. The experts of external practice locations do not take part in it. Cooperation is outstandingly important in a dual training system. Schools, businesses and the chambers need to seek the opportunities in this area. The research shows that half of those entering vocational education and training do not have the necessary knowledge and competences. A part of the applicants are unmotivated. My experience shows that if proper requirements are set at the entry point, then the level of knowledge of those leaving the elementary school will also increase. According to the act on national public education, those who successfully complete the eighth year of elementary school presently may continue their studies without having to pass an entrance examination in vocational schools. Children who have turned 16 but not completed year 8 are placed in the HÍD (Bridge) programme.

The contents, teachability, structure and up-to-datedness of the modules are at an adequate level on the basis of the research. A frequency of 3–5 years is recommended for updates, which can be justified both professionally and as regards teachability.

A third of respondents think the changes in the vocational education and training system should be long-term. The modifications, corrections based on previous experience were necessary in order to operate the modular system, but this has not changed the training system. The changes implemented in 2012 were

built on the experience gained during the previous period, and this is confirmed by the support for the not more than 5 years of frequency for updates.

The examination of module completion included the assessment of the competences as well, which a significant part of respondents approve of and consider assessable.

The place of young career-starters on the labour market is an important issue. The acquisition of professional knowledge is not finished with the training. A trainee period is necessary, which should be developed on the Hungarian labour market in the near future.

All in all, we have found that the development and introduction of the modular vocational education and training system has served the development of the Hungarian vocational training. The necessary changes were built into a new system. The mistakes experienced at the outset did not help the acceptance of the changes, which can still be seen and measured nearly after a decade.

Specialist with a high-level and modern knowledge are needed, and the vocational education and training system needs a higher level of knowledge at the entry point. The partners such as the schools, business entities, professional organisations and maintainers should closely cooperate during the training.

EDIT BRUNBAUER *

Role of Formal and Informal Relationships in Organisational Communication Networks – Focus on Coworking Offices

Abstract: This study discusses an organisational type, coworking offices, that is considered new on a global level, and which, due to its novelty, is a very exciting topic. To date there have been few researches conducted that deal with coworking offices, let alone ones that discuss them from a communication point of view.
Keywords: Coworking,research, coworking office, communication aspect.

Összefoglalás: Jelen tanulmányban egy globális szinten újnak számító szervezeti típussal foglalkozom, a coworking, vagy más néven közösségi irodával, amely – újszerűségéből fakadóan – egy egészen izgalmas témakör. A mai napig kevés olyan kutatás született, amely a közösségi irodákkal foglalkozik, olyan pedig végképp alig akad, amely kommunikációs aspektusból közelítené meg.
Kulcsszavak: Coworking, kutatás, közösségi iroda, kommunikációs aspektus.

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Introduction

The novelty of the topic is proven by the fact that the first coworking office was opened in Hungary in only 2009, and the organisation examined has been on the market for only three years. It became clear on the basis of my preliminary information gathering that it is difficult to categorise them and set limits when it comes to their structural characteristics.

Secondly, building the community is given special attention at such organisations, due to which strengthening informal relationships has a great role. Coworking offices are maintained by developing and looking after a well-functioning community.

[1] Balázs L. (2009): A tudatosság szervezeti kommunikáció szervezésében. In: H. Varga Gyula (Szerk.): *Tudatosság a kommunikációban.* Budapest: Hungarovox.

[2] Carsteb, F.–Cagnol, R. (2015): The History of Coworking In a Timeline. In: *Deskmag.* [online magazin] [2015. 03. 22] <http://www.deskmag.com/en/the-history-of-coworking-spaces-in-a-timeline>

[3] Coworking timeline. In: *Deskmag.* [online magazin] [2015. 03. 22.] <http://www.tiki-toki.com/timeline/entry/156192/The-History-Of-Coworking-Presented-By-Deskmag#vars!date=1995-05-05_17:48:20!>

[4] Skyes Krista: Coworking: A workplace paradigm shift, In: *Contract.* [elektronikus magazin] [2015. 03. 12.] <http://www.contractdesign.com/practice/design-practice/Coworking-A-Workpla-11471.shtml>

[5] Balla Zs.: *Béreljen irodát akár egy napra is.* [elektronikus magazin][2015. 04. 18.] <http://m.origo.hu/uzletreszvallalkozas/20140909-ujragondolt-es-gombolt-irodak.html>

It is very important what kind of attitude they have to clients and how they treat them, at the same time an issue of fundamental importance is to ensure the good relationship among colleagues as well. [1]

What Are Coworking Offices?

The foundation of the first coworking office as we know it now is dated at 2005. It was created by programmer Brad Neuberg in San Francisco as a kind of response to telework, which damaged productivity, and the dry, asocial atmosphere of traditional office buildings. Their numbers have been constantly growing ever since. [2]

According to the online magazine Deskmag [3], the number of coworking offices had reached about 600 by 2010, which trend was helped by the fact that there was more independent workforce available, and the need for social relationships appeared. Presently there are about 3,200 coworking offices operating worldwide, 1,200 of them can be found in the United States. The growing trend suggests that this figure may reach even 12,000 in five years, so it is worth taking this alternative organisational model into consideration in any case. [4]

The first coworking office, Loffice, was opened in 2009 in Hungary, which took Brad Neuberg's model as an example. At the time not even the phrase coworking was very widespread in Hungary. However, now there are several offices in the capital. In addition to Loffice, freelancers looking for quiet, well-equipped places can choose from among places like KAPTÁR, i-Office, Mycorporation, Colabs, thehub.hu, Greenspaces, Innoffice, Phoffice, Kowerk, or Cowo. [5]

It is not simple to define the term coworking either since the available special literature on the coworking topic is very poor both internationally and in Hungary. The first book entitled 'I'm Outta Here' was published in English in 2009. This is mostly due to the fact the phrase started spreading only a decade ago.

The conceptual framework is determined in different ways in the sources, but in general, *coworking offices* can be defined as alternative work areas where small and medium-sized businesses are offered suitable conditions

eliminating the negative aspects of telework. They do not only offer inspirational work areas to those who drop by, but also a chance to join a community, thanks to which the new members may establish new, more comprehensive relationships. [6]

At the same time, it is a cost effective solution for start-up, or small businesses since they can receive clients in the meeting rooms of the coworking offices at any time, thus they can save the fees of maintaining an own office. They do not have to bother creating and ensuring the technical conditions, and catering can also be solved internally at most places.

Coworking offices attach great importance to the fact that the members of their communities feel good, and in order to achieve it, they organise different types of programmes which clients may also join. Since these people operate in different professional fields, the clients of coworking offices constitute really colourful communities. Script writes, graphic artists, artists, lawyers, financial consultants, PR and IT specialists, translators, trainers, coaches have the possibility to flexibly use the work areas, which can generally be rented on a daily, weekly, monthly basis, but they are open to ad-hoc use as well.

Clients are not committed for years in advance, everybody can choose the package that is ideal for them. [7]

Last but not least, several places offer virtual office services, which means the given business only nominally designates the coworking space as its place of business, where the client's post is delivered, where they receive and forward calls, use meeting rooms – if necessary –, but the employees of the company actually work from home. This opportunity is mostly used by businesses that are in the process of abandoning their offices due to high costs, but also find it too expensive to rent the whole coworking area.

Formal and Informal Communication

Before the research is presented in detail, two fundamental concepts have to be defined. There are two types of communication methods within an organisation; formal and informal communication. The structure and operational framework of the *formal communication* system is always determined by the management of the given organisation. They decide which operational units need to report to one another, who need to receive certain types of information, furthermore, they may

[6] Kicsid A.: Közösségi irodák. Hogy ne a mosatlanon járjon az eszed munka közben. In: *Pénzcsinálók.* [elektronikus folyóirat] [2015. 04. 13.] <http://penzcsinalok.transindex.ro/lokalis/cikk/14451>

[7] Hódít a közösségi iroda. In: *HVG* [elektronikus magazin] [2015. 05. 02] <http://hvg.hu/ingatlan/20130125_Kezdo_vallalkozasoknak_idealis_a_kozosseg>

determine the communication tools necessary for it and their operation. [8] On the basis of the operational theory approach to communication, formal communication networks actually constitute the channels of information flow within an organisation. The basic tools of formal communication are through writing, telephone and personal.

Internal communication may take place within an *informal* framework. These networks are created spontaneously since their foundation stones are the personal relationships within the organisation. Possible friendships developing between members, and webs of interest are of outstanding importance. Informal networks are perfectly suitable for transmitting employees' opinions, wishes, fears, and it is not of secondary importance that information spreads a lot faster through them, especially in cases when the given piece of information concerns employees' interests.

Informal relationships may bring the members in a group structure closer to one another, which results in more frequent interactions between individuals. [8, 9, 10]

At the same time, informal communication may cause confusion in the system if, through the informal channels, the information reaches people who are not necessarily affected. Furthermore, it often occurs that some people have extra information due to their informal relationships, and as a result, they obtain a kind of informal power.

On the other hand, there are situations when the so-called "opinion leaders" get into the centre of the group, who are not necessarily leaders in the formal structure, what is more, they may even be at lower levels in the hierarchy. Thus the relations developed within the group may have serious effects on the structure of the group. [11, 12,]

Research Questions, Hypotheses

Before defining the exact research presuppositions, it is important to make it clear who belong to the group I am studying. As a result of the characteristics of coworking offices there are clients who use their services on the short run only by buying daily tickets or reserve a meeting room, thus they do not belong to the regular clients (they do not have contracts). They are called outsiders, ones who seldom and irregularly visit the offices. Insider clients are considered the ones who have bought some kind of a rent agreement or use a registered office service. The latter group is

[8] Borgulya Á. –Somogyvári M. (2007): Kommunikáció az üzleti világban. Budapest: Akadémiai.

[9] Borgulya I.– Vető Á. Á. (2010): Kommunikáció-menedzsment a vállalati érték-teremtésben. Budapest: Akadémiai.

[10] Forgács J. (2007): *A társas érintkezés pszichológiája*. Kairosz.

[11] Klein S. (2001): Vezetés- és szervezetpszichológia. SHL Hungary.

[12] Rosengren K. (2008): Kommunikáció. Budapest: Typotex.

also rarely seen since they merely wanted a place where they could register their business and their mail could be sent to. They only rarely use the meeting rooms if they wish to meet a client since the office, with its modernity and modern technical equipment may increase their prestige.

The group defined as insiders and the members of the work team are called community members. It is people who often spend time in the office and are regular participants of the above mentioned community programmes who belong in this category. As a result, I classify these people in the internal, communication network.

As a result of these, I suggest the presupposition that close *informal relationships are formed among the members of the team.* This is the reason why a close, *informal network of relationships develops between the clients making up the community and the members of the team. Furthermore, I think that the people who have key roles in the formal structure will also have a central role in the informal network.*

Research Methodology

Since I wished to study both the formal and informal networks of the organisation in the course of my research (mostly focusing on the latter one), I chose two types of methods to survey these areas. I selected qualitative interviews to obtain a full picture of the formal structure of the coworking office since this is the method that can best survey the formal characteristics. It was a primary aspect during the interviews to ask the three owners and the members of management that are close to them.

Due to the fact that I considered the operation and structure of coworking offices quite unconventional on the basis of my previous knowledge, I did not change the questions since I was curious how they view the organisation. I asked about the structural characteristics – sharing work, sharing scope of authority, coordination, configuration –, the form and structure of the organisation and the communication channels, that is, the way information is spread within the organisation.

As for sampling, it is not probability sampling since the elements were not selected randomly. I applied multi-stage sampling during the sociometric research since a part of my research includes the whole population (every person is surveyed of the employees). However, they survey including the members of the community is based on expert sampling since I selected them from among the clients on the basis of a certain criterion.

On the basis of the criteria I only classify those as insider members who have monthly or annual contracts and thus spend a lot of time in the coworking office. In any case, the sample is not representative since I studied only a subsample of the population.

Sociometry

Professor J.L. Moreno developed the method of sociometry, who, contrary to the customary approach beforehand, was the first to study the social formations and determined the individual's place within them. He tried to explore how the individual fits into the social field, the way they adapt and the skills needed for establishing contacts. He tried to examine adaptation not by assigning personal characteristics, but through the individual's social position. As a result, sociometry is a method that makes it possible to explore and describe the hidden networks of communities.

During the practical implementation Moreno followed the basic idea that human relationships are always based on emotions and instinctive attraction, so he tried to explore hidden networks along these criteria. He was convinced that the answers he obtained in this way – since it was about emotional, spontaneous connections –, help to obtain a fuller picture of the hidden network of relationships in the organisation. [13]

Developing the basic idea Moreno had furher, Ferenc Mérei worked out a multi-aspect sociometric survey. Thanks to his method, attraction motives make up only a small part of the questionnaire, and it additionally focuses on topics that are more related to groups, but general questions are also included that try to bring the stereotypes in people come to the surface. As a result, it does not only reveal the individual's position within the group but presents the network of the whole community as well.

The different formations that may develop within the social field may be the following:
– *Open formations:* Pair, chain and star formations are included here.
– *Closed formations:* Triangle and rectangle formations are classified in this group. The number of mutual relationships is the same as or more than the number of people in the formation.

According to Moreno, one of the basic criteria of performing a sociometric study is, if possible, to do it at the place where the community exists, works, that is, under real circumstances. This is necessary because in this way the people included in the research can better identify themselves with the situation, memories can sooner surface at the place where they lived them through. On the other hand, it is an advantage if all the members that can be included in the research are present during the study. However, this criterion is not realisable or fortunate every time. [13]

As far as the examination of communities is concerned, the questionnaires were administered online, and most of the members were not in the office when they were filling them in. Twenty-two people filled in the questionnaire. Nine of them are members of the

[13] Mérei F. (1996): *Közösségek rejtett hálózata*. Budapest: Osiris.

organisation's work team, thirteen of them members of the community, that is, belong to the insider client group. Positive or negative criteria may be stipulated during the research in the course of the selection. Since previous experience shows that multiple self-correction occurred during surveys performed with adults, what is more, they often ignored the selections on the basis of negative criteria, I used positive values during my research. [13]

On the basis of Mérei's work, questions were assigned to four types of criteria in the course of multi-criteria sociometric analysis. As regards their distribution, six questions were asked about attraction, five about abilities-characteristics, five about functions and two about popularity. By breaking down these groups of questions, seven main criteria were introduced on the questionnaires used today. I also considered these when drawing up the questions for my survey. [13]

1) *Questions about attraction*, where respondents had to mention three people in all cases: Who would you prefer to work with? If you set out on an excursion to the mountains from the organisation, which three members of the community would you invite to your car? If the community organised a several-day long excursion, which three members would you like to share your room with?

2) *Questions exploring the confidence criterion:* Who would you share workplace gossip with? If you need help with solving a problem, who do you turn to first? Who would you choose as a mentor if there was such an initiative?

3) *Activity function:* Who would be the most competent to organise a function (e.g. team training, community evening/lunch)? If the head of the team got sick, who would be the most suitable to replace them?

4) *Talent in the professional field:* Who would you ask to be your partner when preparing a project? Who would be the most suitable person to organise negotiations?

5) *Questions examining the criterion of fairness:* Who do you think could solve minor conflicts within the community in a fair way? Who do you think would be capable of solving a delicate situation within the community? Who tells others openly when they do not like something?

6) *Questions exploring characteristics:* Who is the member of the community you consider the most intelligent? If difficulties arise during work, who do you think could help the team to go on with their enthusiasm? Who do you think would take a stand for a member of the community if they were treated unjustly?

7) *Questions about popularity and exploring the ability to succeed:* Which member of the community do you think succeeds the best in life? Who do you think is the most popular person in the community, known by most people? [13]

I prepared the questionnaire for the research on the basis of Ferenc Mérei's work, and I used the Organisation Sociometry software to examine the results, which program I only had for the purposes of the research.

Research

On the basis of reciprocity and frequency tables obtained in the course of data evaluation, a total of 204 relationships are declared in the surveyed community without considering the given criteria. Thirty-two per cent of the relationships possible sociometrically were realised on the basis of it, while 57% of the declared relationships were reciprocal.

In the case of multi-aspect sociometry, the indexes that help to interpret the obtained data can be placed in four big groups. These four groups are the indexes of structural indexes, group atmosphere, selection coincidences and the dimensions of division.

My study only deals with the indexes of the first group, which can explore the structure of the whole of the social field. This can be divided into four subgroups. Among them is the CM (*central-marginal*) index exploring the relationship between the central core and the peripheries. The second subgroup helps to determine the proportions of the different *formations* (already discussed above). These can be closed, chain, star, pair formations, but those in isolated position also belong here.

The third subgroup is made up by the four *cohesion indexes* (mutuality, density, cohesion, reciprocity), which can be used to determine the tension of the group of members. The fourth group is the exploration of the *structural type*, which is obtained from the relationships between the indexes and the formations of the sociogram.

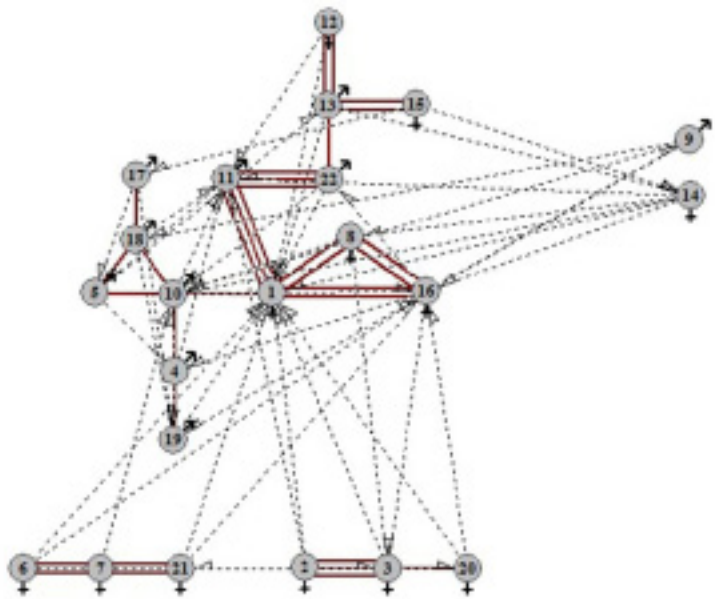
Structure of the Group

Group structures have different types, they can be a cluster, loose, having a single centre and wide peripheries, one block or with several centres. These structural types refer to the level of the community and degree of its development, and can be assigned to the trends of age development.

As far as the group I examined is concerned, it suits the block category. A single large block includes about a half of the community. The number of isolated people, and of those who are on the peripheries is low (*see Figure 1*). As confirmation, the index of reciprocity is over eighty, and that of density exceeds one. In addition, a quarter of the relationships have several connections. [13]

[13] Mérei F. (1996): *Közösségek rejtett hálózata*. Budapest: Osiris.

Figure 1. Reciprocal and Non-reciprocal Relationships in the Informal Network.



Cohesion Indexes

When a social field is examined, the first thing to do is to explore the cohesion of the formation. Cohesion is actually tension in group dynamics, which the members of the group experience as a sense of community, solidarity and belonging to one another. If cohesion is high in a community, the experience of belonging together can be traced through the participation in common matters, sense of community and solidarity. Low cohesion suggest that the number of experiences lived through together is low, as a result they have fewer common customs, or they are more indifferent to group tasks.

The degree of cohesion is expressed through several indexes. First, the *index of reciprocity* shows what percentage of the people in the field have mutual relationships. Certainly, the higher the index is, the fewer isolated members there are. The average value of the index of reciprocity is between 85–90. [13]

According to the survey of the community, considering the index of reciprocity, 91% of the people in the social field have mutual relationships, which is a very high value. The number of isolated individuals is insignificant, it is only two people out of the 22. The mobilizability of the group, and their ability to offer security are above average. However, it is important to note about the latter one that total security can only be achieved if the value is exactly one hundred, that is, everybody has reciprocal relationships.

The *index of density* can be obtained from the ratio of group members and reciprocal relationships. This value shows how many reciprocal relationships an individual has in the social field. The value is above one in stable communities (0.96 in the case of adult communities).

There are 1.45 reciprocal relationships in the social field of the organisation examined, which proves the stability of the community.

The *cohesion index* shows what percentage of the total of sociometrically possible reciprocal relationships have been realised in a social field. Its value is calculated using the n (n-1) formula, where n=number of group members. The average value of the cohesion index is between 10-13. If this figure exceeds 15, it suggests a high degree of cohesion.

As regards the cohesion index of the surveyed community, it has been found that 32% of the sociometrically possible relationships are realised.

The last cohesion index is the *index of reciprocal relationships*, which is also obtained on the basis of the mutuality table. It can be calculated what percentage of the declared relationships is reciprocal. The average of the index is between 40–50. The higher the number is, the more disciplined the community is, and the more inclined it is to conformity. As regards the community, it has been found that 57% of the declared relationships are reciprocal, that is the community is within the optimal range, which suggests that the members of the group have a realistic approach to relationships, but their desires also prevail in their choices.

CM (central-marginal) Index

Before performing the analysis of the different relationships, formations, first it should be examined if the structure of the social field has a central point that can be determined, and how extensive the peripheries surrounding it are. On the basis of the special literature, the centre can be defined as a closed formation to which at least a quarter of the members found in the social formation are connected. Basically, if it is a closed formation, every member has at least two relationships. Closed central formations mobilise communities to a greater extent, increase the tension and the strength of flow of events.

It is important that the central core reach as big a part of the social field as possible through communication channels, because the uniform view they represent reaches every member through these

relationships. If the formation is too closed, has few outgoing and branching out connection points, the information is stuck and cannot reach the intended people.

However, a social field cannot only have one central point but two or even three. The more centres we can find, the more developed and differentiated the surveyed community is, at the same time, it is usually rivalry that can be found at the back of such occurrences.

The peripheries of the social field exist only through their relationship to the centre. The members of the community who, for some reason, are not connected to the central formation of the field, are placed on the peripheries.

It can be established on the basis of the sociogram depicting the community of the coworking office that the individuals numbered 10 and 1 constitute the centre, they are in direct relationship with each other. The individuals numbered 17, 18, 5, 4, 19, 11, 22, 13, 15, and 12 are connected directly or indirectly, which means, the two-person centre has a communication channel to a total of ten further people. Their influence thus extends to over half of the community. The remaining eight people are on the peripheries.

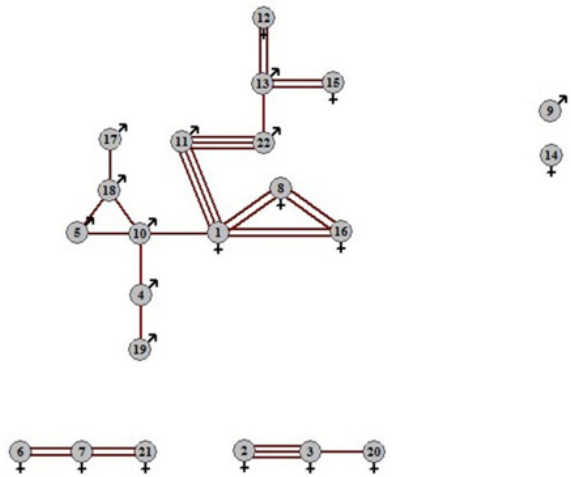
When calculating the CM index, the relations of three different data are considered, which are the following:

– extension of the central formation of the social field
– the social space under their influence
– the peripheries that can be determined as a separate field

The relation of the three data calculated for the CM index in *Figure 2*, expressed in numbers is: 2–10–8. Two people make up the central core, ten people can be found around them in the social field, while 8 people are on the peripheries. It should be added that not only the isolated ones of the people on the peripheries are considered. Six people – two groups of three – make up chains with one another.

When the proportion of the central-marginal is considered, it can be established that because of the narrow periphery, the community can be considered active, group norms are mostly followed, the people constituting the central core have great influence on the whole group.

Figure 2. Depiction of Reciprocal Relationships.



Examination of the Formations

As regards the formations there are individuals who are only connected to the group core through one link, and have a relationship with only one member. A separate formation of members 17, 18, 5, 10, 4 and 19 can also be seen. The two formations are connected by individuals 10 and 1, so they ensure the spread of information as well. They make up the "connective tissue" of the social field, they actually function as the cohesive links of the communication network. Although the spread of information is ensured in this way as well, communication is more complicated at certain levels since it takes a lot longer to spread the information. This also creates a bigger chance of distortion.

They both are in a kind of celebrity situation since there are four people connected to them in a star shape, and the fourth link of their central position in the formation is the link between the two of them.

The sociogram can basically show the individuals who are isolated, as well as those who are in a pair relationship. According to special literature, if the number of isolated individuals is high, the people in the core of the community seclude themselves from the other members of the social field, which is not favourable for the group's atmosphere. The number of pair relationships is an indication of to what extent the members of the community require intimacy, to what extent they accept it. It reveals the frequency of secret relationships, love relationships and friendly connections.

As the figure shows there are only two isolated individuals out of twenty-two in the surveyed social field, which leads to the conclusion that the atmosphere of the community is developing in a favourable way, it is characterised by calmness, the level of tolerance is higher, and we are looking at a basically well-managed community.

The network of relationships does not purely show pair relationships. However, individuals 4, 19 and 17 are in pair relationships due to the fact that they are connected to a closed formation through single links.

The other members situated on the peripheries are connected to one another in chains. One of the chains include members 6, 7 and 21. All three of them are women, connected through reciprocal relationships. Individuals 2 and 3 in the other formation have a threefold reciprocal relationship between them, which suggests a very close relationship. Member 20 is connected to them through a loose link.

As regards the members on the peripheries we can state that the number of individuals isolated from the core of the group is within acceptable limits.

As regards forming opinions and creating values, closed formations can only be interpreted as a unit if the relationships are reciprocal. This is important because it is the only way when we can talk about two-way communication, otherwise the information does not reach every member of the formation. [13]

Individuals 1, 8 and 16 form a triangle-shaped formation, which suggest that they convey information among themselves separately, as regards the mutuality criterion, individuals 8 and 16 are isolated from the others. Their connection to the social field and the core of the group is indirectly due to individual 1. Communication happens through that person, this is how information is forwarded. A friendly relationship is suggested by the twofold reciprocated selections among the three individuals.

Individuals 5, 18 and 10 belong to the other triangle formation. A loose, professional relationship can be assumed due to the one-time selections. Individuals 17, 4 and 19 are connected to them. The latter two as a pair, however, their relationship is also of professional nature.

[13] Mérei F. (1996): *Közösségek rejtett hálózata*. Budapest: Osiris.

Figure 3. Sociogram on the basis of roles within the organisation.

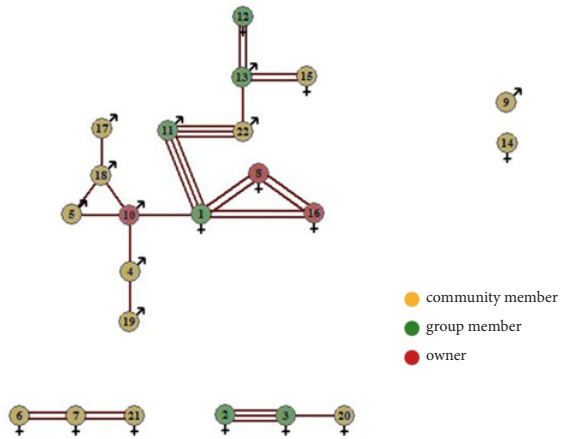


Figure 3 throws light on the role people have in the organisation. Along this line, the whole community can be divided into three big groups. The number of community members is 13, there are 9 group members, and three of them belong to the owners.

If the graph is analysed by group we can see that the majority of the community members (53%) are connected to the group core. The remaining members (47%) are situated in the peripheral area, four of them in a chain-like formation, two of them totally isolated, lonely.

The two individuals ensuring the connection between informal networks, members 1 and 10, belong to the work group, one of them (1) is among the founding members.

The number of threefold reciprocal relationships in the social field is three, which can be seen between individuals 2 and 3, 1 and 11, and 11 an 22. Four of them are members of the team, and only one of them is a member of the broader community. One of the members is male, the other is female in one of the threefold selections, which suggests an intimate relationship.

An interesting result is that two team members – individuals 12 and 13 – are connected to the network by one of the community members, which suggests that the information flow is ensured by individual 22. It is individual 13 who is connected to individuals 12 and 15 through friendly twofold reciprocal relationships thus connecting them to the more dense part of the network.

The central block has several lines that branch out, which suggests that the atmosphere has not shifted towards exclusion, that is, people on the peripheries also have the chance to connect to the group core.

The results show that a close relationship based on attraction has developed among community members. Individuals 17, 18, 5, 4, and 19 connect one another to the formation, within which a closed triangle-shaped formation has also been formed, which suggests that there is information flow through them towards the individuals more loosely connected to the formation.

There is a close informal relationship based on mutual attraction among individuals 1, 8 and 16. As a result of the uniform twofold selections it can be assumed that it is a friendly relationship between the concerned individuals. Two of them are owners, while one of them is a member of the work team. Since the two owners are only indirectly linked to the core, it can be assumed that they are a lot less present in the life of the organisation than individual 1.

Comparison of Formal and Informal Networks

Before the beginning of the research I started from the assumption that the interaction of the formal and informal networks would show a high degree of dynamism, so I will try to prove this supposition of mine by comparing the two networks.

The examination of the formal network shows that the founding members and the member of the management connected to them play an important role in the life of the organisation. It is them who make the final decisions, they determine the future general direction, and they pull the main strings whether it is about finances or marketing.

When surveying the informal structure, we can clearly see (*Figure 3*) that the founding members are connected to one another and belong to the group core. On the basis of the table of frequency, individual 10 of the founding members was chosen the most often, but it is important to pay attention to individuals 1 and 16, the latter one is also one of the owners.

The table of reciprocity also shows that there is a high degree of agreement among the members about fairness and the attraction criteria, so it can be assumed if they choose someone to work together with on a project, it will not be on the basis of the person's expertise. As a result, informal networks have a strong influence on formal structures when it comes to sharing tasks.

On the basis of these results, it can be stated that the people who have a central role in the formal structure are closely connected to one another from an informal point of view. Thus the latter absolutely brings the informal network to its fullness and strengthens it.

Summary of Results

In the course of the research I tried to explore the formal channels as well as the informal network of relationships of the coworking office. My supposition was that a *close-knit informal network developed among the clients and team members constituting the community,* which proved to be true. It can be seen that all community members in the group core are directly or indirectly connected by a team member, they are the hubs, so a loose informal network clearly exists between the team members and the community members based on the attraction criteria.

As regards the team members, it did not prove to be true that a *close network of relationships developed among team members* since there are individuals who are on the periphery or only a single link connects them to the group core. When quantified, two out of nine individuals are on the periphery (2 and 3), and two people are connected to the network by looser ties (12 and 13). These four people are supposedly new members in the work team.

It became clear during the research that it is a loyal community whose lives are greatly influenced and formed by informal relationships. *The people who have a key role in the formal structure maintained their central positions in the informal network as well.*

However, apart from the fact that it is a strong, loyal community, the organisation should pay more attention to the individuals stuck on the peripheries in the future. It is advisable to connect them to the group core as well because by doing so the community will become more loyal and united. Another important aspect, which can be developed, is that more attention should be paid to the integration of the new members of the work team – if my supposition is right and the four individuals only loosely linked to the group are newcomers. It is important to pay attention to it because information spreads among people stuck on the periphery in the form of gossip only, on the other hand if they feel excluded it may force them to leave the team.

It may be worth extending the research to all the coworking offices in Hungary and examine the extent of cohesion the community has as well as the characteristics of formal and informal communication. It would be interesting to see whether there is a difference between the individual offices, so whether this organisation form basically helps develop a strong network of relationships.

ÁDÁM ATTILA DURDA *–LÁSZLÓ HÁRI **

Improving the Quality of Nodular Graphite Cast Iron by Observing the Technological Instructions

Abstract: Due to its advantageous mechanical and casting characteristics as well as its lower manufacturing cost, spheroidal graphite iron is gaining more and more ground among the methods of application of steels. An increasing part of the Hungarian production is spheroidal graphite iron besides the traditional grey cast iron quality. According to the standards, manufacturers must guarantee either the hardness of the cast product or its tensile strength and normal strain. The specified mechanical characteristics are ensured at manufacturer's discretion through the correct settings of the chemical composition and production technology such as tapping temperature and casting temperature or the correct dosing of magnesium. The research of the authors show that combining the specified values of chemical composition with the correct settings of production technology, the desired mechanical characteristics can be achieved in most cases.
Keywords: Spheroidal graphite iron, grey cast iron quality, tapping temperature and casting temperature, dosing of magnesium.

Összefoglalás: A gömbgrafitos öntöttvas előnyös mechanikai és öntészeti tulajdonságainál valamint kisebb önköltségénél fogva egyre nagyobb teret hódít el az acélok felhasználási területéből. Magyarország is egyre nagyobb részarányban gyárt gömbgrafitos öntöttvasat a hagyományos lemezgrafitos minőség mellett. A gyártónak a szabványok szerint garantálnia kell az öntvény keménységét, illetve a szakítószilárdságot és a nyúlást. Az előírt mechanikai tulajdonságokat a gyártó, saját belátása alapján, a kémiai összetétel valamint az olyan gyártástechnológiai paraméterek helyes beállításával biztosítja, mint a csapolási és öntési hőmérséklet vagy a magnéziumadagolás helyes mértéke. A szerzők vizsgálatai azt mutatják, hogy a vegyi összetétel előírt értékét kombinálva a gyártástechnológiai paraméterek helyes beállításával,

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az esetek többségében elérhető a megkívánt mechanikai tulajdonság.
Kulcsszavak: Gömbgrafitos öntöttvas, lemezgrafitos minőség, csapolási és öntési hőmérséklet, magnéziumadagolás.

Introduction

The basic problem of cast product manufacturing and quality all over the world is that despite the strictest specifications, the actual quality, for example the actual values of the mechanical properties only become known well after manufacturing.

It is typical of cast product manufacturing today that the – little analysed – physical, chemical and thermal qualities of moulding, smelting, casting, cooling arising from the technical level of their technologies, their level of reproducibility together with subjective mistakes may cause significant differences in their properties, which manufacturers endeavour to explore and eliminate by introducing tightened technological measures or using e.g. SPC methods. Due to the uncertainties of the technology, manufacturers employ oversecuring.

On the one hand, it results in a general additional cost factor, while on the other hand it still true sometimes that they cannot meet the minimum parameter values.

In such cases manufacturers – in the case of mass products – may requalify their products into another still marketable quality level and may get off the failure without a loss, but this is not a possible way in the case of manufacturing unique products.

In such cases the reject can usually be corrected using heat treating, but if it cannot, the manufactured pieces are rejected for good and this does not only waste the energy used for smelting, but also die making, which costs several times more, as well as labour costs.

Main Characteristics of Nodular Graphite Cast Product Manufacturing

Melting of Cast Iron

Nodular graphite cast iron can be manufactured from charge materials that are clean, free from contaminants that hinder spheroidizing. The main interfering elements are the following: S. P, As, Sn, Sb. In addition, all the carbide formers are interfering elements; they hinder graphitic crystallization. Since the carbide forming effect occurs only when there is a higher level of additional components present, certain carbide forming elements may be used as strength-increasing alloys between 0-1% to manufacture nodular

graphite cast iron. Such elements are most of all Mo and Cr. They are used mainly for high-strength cast products. The charge material of nodular graphite cast iron manufacturing is scrap steel free from external contaminants, grey pig-iron or high-test Sorel iron.

Since the price of unalloyed steel sheets is about a half of that of grey pig-iron, and a third of Sorel iron, the charge material usually contains a lot of scrap steel, which has to be used with carbonizing agents. This is usually added together with the cold charge, and carbonizing takes place during melting down. One of the critical points of nodular graphite cast iron manufacturing, and one of the tests of spheroidization is the achievement of the proper degree of normal strain (especially in the case of low-strength qualities). This degree of normal strain rivalling the normal strain of steels is achieved by the setting of the texture. The wat to do it is to ensure low pearlite and carbide content by excluding ledeburite texture. Low perlite content can only be achieved with charging materials with low MnA contents.

The typically available or obtainable materials are scrap steels with high Mn content (about 0.5–0.7%), or the steel-making iron with varying Mn content (unusually 0.5–1.0%). The Mn contents of the casting crude iron is lower than that of the previous ones (about 0.4-0.6%), but not even that can ensure the proper normal strain. The Mn content of the Sorel iron manufactured in electric blast furnaces using acid steelmaking process is the best (about 0.1–0.2%).

The machinery of nodular graphite cast iron manufacturing has undergone significant improvement in the last decades. The nodular graphite cast iron manufacturing started about 30 years ago used cupola furnaces, the high sulphur content iron of which had to be desulphurized outside the furnace. The improvement work performed in the last 10 years resulted in most of the iron foundries melting the iron in electric induction furnaces. This can produce the desired purity and temperature. The setting of the conduct of heat and the fine tuning of metal composition are helped by a spectrometer, which is connected to the smelter via pneumatic mail.

Seeding of Cast Iron

The traditional preconditioning of the melted cast iron melt is seeding, the purpose of which is to influence the texture of cast iron by ensuring the proper number and quality of nuclei for the crystallizing process, whether it is lamellar or nodular graphite cast iron quality. Supercooling needed for graphitization decreases if this general purpose seeding is used, and thus the propensity for carbide formation (decolourization) also decreases.

The material is usually some kind of Si-based alloy, with about 0.10% of Si. It is worth mentioning the preconditioning with Zr content of the seeding types used for other purposes, which prevents the formation of a hard casting shell. It is typical of them that their effect is temporary since during melting,

holding, superheating the "own" nuclei from the raw material and the foreign nuclei melt, decompose depending on the extent of superheating and the period of holding.

The cast made from iron of this condition is of coarse texture, low in graphite and has a propensity for decolourization. The proper number of nuclei are inserted externally into the melt during the seeding, which creates the base for the crystallizing of the proper-shaped graphite. The main point of the graphitization modification (seeding) is to increase the number of graphite nuclei as well as to increase the temperature difference between the graphite and carbide crystallizing processes, thus decolourization will not occur on even the thinner walls of the cast. Since the seed does not produce slag or other contaminants, it has to be achieved that crystallization start as soon as possible after seeding, before the number of nuclei start dropping fast.

Sphering Cast Iron

A The most typical procedure of nodular graphite cast iron manufacturing is sphering, as a result of which the graphite is crystallized in a spherical shape, thus significantly altering the mechanical characteristics of the product. The sulphur and oxygen contaminants impairing the surface tension of the iron melt are removed during the sphering. An MgS compound is formed during the preconditioning, which rises and dissolves in the slag after the preconditioning. This means that a part of the Magnesium added to the iron melt desulphurizes, while a part of the part remaining in the metal evaporates, and the rest remains in the metal dissolved. In previous years, manufacturers used another strongly desulphurizing Ce-La rare-earth metal alloy, which, in addition to its high cost, had carbide crystallization as an unpleasant side-effect. Previously, there were attempts to use pure magnesium, but due to the high steam pressure, the addition of the metal practically produced a series of explosions, which, apart from creating accident risks, resulted in a huge loss of base meal and poor magnesium yield. The path of development was the use of MgFeSi seeding materials with 5–10% Mg content. Other countries also use Cu and Ni-based Mg alloys for nodular graphite cast iron. Ce and La have also reappeared in MgFeSi alloys in the last few years. In such cases the role of the 1–2% of Ce and La in addition to the 5–10% Mg content is to neutralise the harmful companion elements (Pb, As, Sb) and thus facilitate the formation of advantageous graphite shapes [1].

The effects of the sphering preconditioning are also temporary, that is, its effect is the strongest directly after adding it to the melt, then the effects quickly decrease, disappear.

[1] Without Author: ELKEM Technical Information 26. Fading of Nodularity in Ductile Iron.

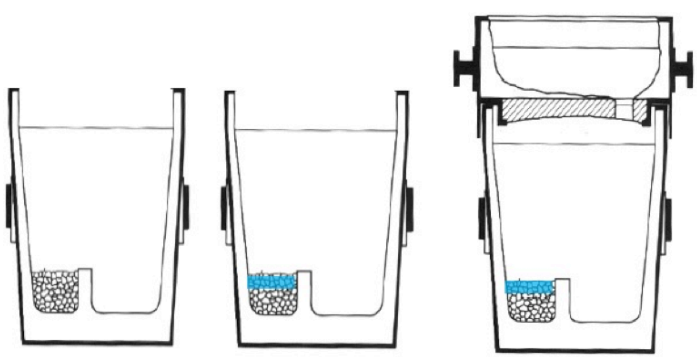
It is typical of the sphering effect of the agent and the technology that it is effective for 15–20 minutes after the preconditioning. The composition of the seeding material, the sulphur-content, temperature and surface tension of the treated iron should be mentioned of the factors influencing the disappearance of the effect.

There are different ways for the sphering preconditioning, they are the following: adding it during tapping, injection with inert gas, additional tapping, addition with immersion bell, preconditioning under pressure. The preconditioning technology has shifted towards simplicity recently

Description of the Tundish Process

Csepel Metall Ltd uses the a Tundish ladle for the preconditioning, which is one of the most widespread processes worldwide due to its simple structure and very good Magnesium yield. The essential part of the appliance is the special ladle lid, which allows the liquid iron to flow into the ladle at a predetermined speed, which blocks the only opening in the process and creates overpressure. These two effects result in an increase in Magnesium yield, which may even reach 95%. The ladle lid and adequate sealing are needed for good efficiency so that the resulting pressure can have the required advantageous effect.

Figure 1. Scheme of Tundish ladle used for seeding nodular graphite cast iron and the coverage of the rich alloy . [2]



[2] Hartung, C. (2014): How to Make Ductile Iron using MgFeSi in an Optimized Ladle Treatment combined with Preconditioning. 7th Int. Ankiros Foundry Congress.

Figure 1 shows the double bottom design of the Tundish ladle, which serves the purpose of postponing the melting-down by first letting the liquid iron pour on the top scrap, which then cools down and the cooled melt reaches the preconditioning material when the ladle is quite full. The less hot melt and the higher metallostatic pressure causes a better magnesium yield.

In order to choose the proper rich alloy cover, the company conducted several tests previously. When they are followed, nowadays nodular graphite cast iron manufacturing is a routine procedure. When a new rich alloy is used, or in order to further improve the preconditioning technology, there are still preconditioning tests conducted now and then.

Following it, nowadays nodular graphite cast iron manufacturing is a routine procedure, which is sometimes conducted again when a new sphering preconditioning is introduced. Following the sphering preconditioning, the iron is poured into drum-type ladles, from which the chemically bonded sand forms are poured in not more than 15–20 minutes.

Figure 2. Casting into casting boxes. Due to oxidation and evaporation under atmospheric conditions, the effects of the preconditioning agent slowly disappear.

Database of Nodular Graphite Iron Cast Manufactured in Csepel Metall Works

Obtaining the Data

The company made the melting log of the first quarter of 2015 available to us. These logs include all the information, data that were registered for the casts made during the different shifts. The limited company manufactures nodular graphite cast iron of different quality, the data of which was used to create a database. This basically includes the input-output data of manufacturing processes such as chemical composition, tapping temperature, casting temperature, the mass of the material cast from one ladle and the number of cast pieces.

It was not possible to group the material qualities belonging to the different casts on the basis of the melting log, since the cast iron qualities are determined by cast at the Limited Company, which means, they handle the data as a log and do not make use of the opportunities offered by spreadsheets. An average day sees 8–10 castings and preconditionings at the company, the work is done in two shifts, in the mornings and in the afternoons.

The components are registered in the following order: FeSi, FeMn, FeCr, FeMo, Ni, Cu, Sn. The type of the preconditioning material (with 6% Mg content) FeSiMg. Data of quick analysis (C-content as %, Si-content and the C-equivalent created from it) as %. Chemical composition measured with a spectrometer C, Mn, Si, S, P, Mn, Mg, as well as Cu, Ni, Cr if their values are above 1%. Casting data: tapping temperature, casting temperature, mass of liquid metal, mass of inoculating agent as kg, number of drum-type ladle, time of casting, sample number. A Y25-type test specimen is prepared for every casting, with the help of which the mechanical properties of the test specimen are examined such as Rm (tensile strength), Rp02 (yield point), HB (Brinell hardness number), A5 (normal strain).

The following are recorded of the metallographic data: ferrite content (F), shape of graphite (GA) size of graphite (GM). The shape and size of graphite is determined on the basis of the MSZ EN ISO 945-1 standard. Furthermore, the cementite content is also recorded (C). The mechanical data are recorded in a separate log. [3]

[3] Csepel Metall Kft. (2015): *LC olvasztási napló.*

[4] http://www.steelnumber.com/en/standard_steel_comparison_eu

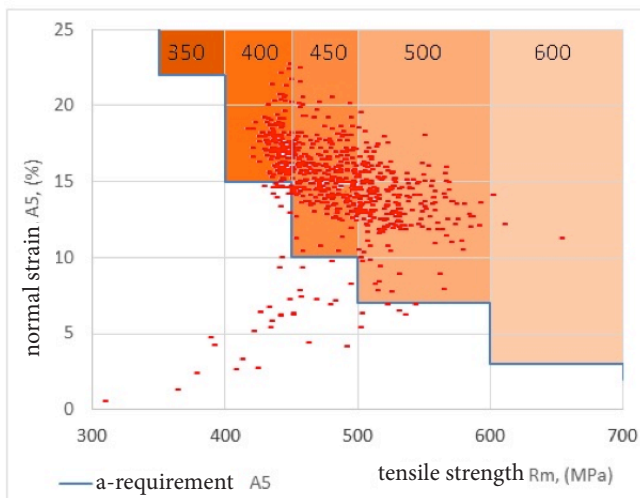
Examination of Database Using Data Classification

We created an 808-line Excel database from the manufacturing data left after several examinations and screenings, with the help of which frequency diagrams, regression curves and different statistical statements were prepared. These constituted the basis of our findings.

By crating Rm - A5 value pairs from the data, we obtained *Figure 3*, which sheds a light on the existing shortcomings [4].

The Figure clearly shows that the company did not produce GJS 350 quality during the given period, most of the products were of GJS400, GJS450 and GJS 500 quality, and only three products can be found among the GJS600 quality. At the same time, it can also be seen that the normal strain of several value pairs do not meet the standard requirements in the 400–450–500 strength categories. We would like to discuss the reasons for these deviations in the following section.

Figure 3. Achieved tensile strength – normal strain results compared to the standard requirement.



The normal strain figures belonging to the given tensile strength values but found in the light area (reject) can be divided into two groups. The first group is close to

the standard normal strain limits, and their normal strain values deviate by not more than 1–3% from the requirements. This small amount of deviation of normal stain may be corrected using heat treatment.

The other group of deviating data can be placed in the approximately 0–11% normal strain range, and their position clearly sharply differ from the nearly hyperbolic form of the main data.
We further examined the Rm-A5 and HB-A5 value pairs.

Figure 4. Depiction of all normal strain figures, as well as those with deviating values as a function of Rm (number of deviating values is 58).

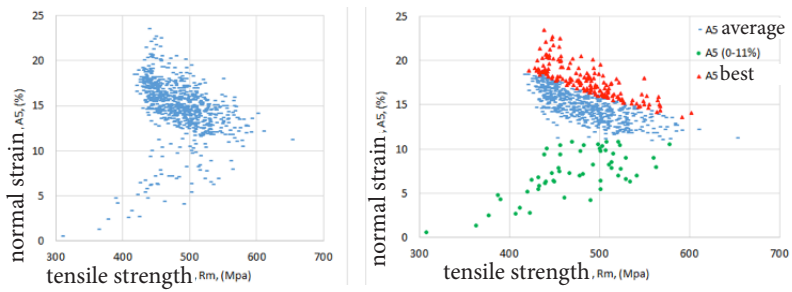
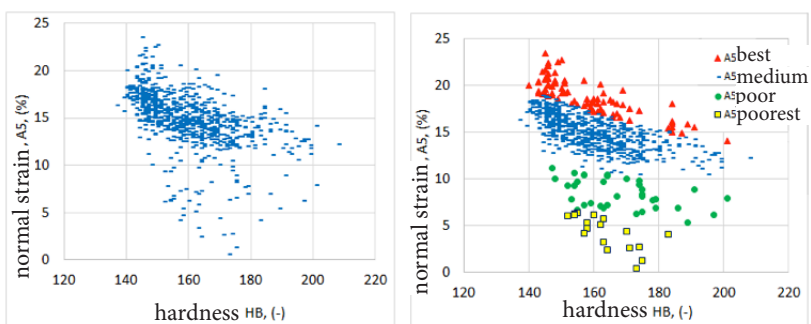


Figure 5. Depiction of all normal strain figures, as well as those with deviating values as a function of HB (number of deviating values is 58).



The clusters broken down into normal strain groups showed valuable trends. These are shown in *Figures 4 and 5*. First of all, it was obvious that the deviating data standing out of the approximately hyperbolic trend were the same. Both groups of diagrams show that a wide variety of normal strain values can belong to the same tensile strength, for example the value Rm = 500 MPa with 11% and 20%. The same trend can be observed in the case of the value pairs HB-A5.

The decrease in the normal strain belonging to the same strength parameters must be evaluated as a deterioration of quality, the direct and indirect metallurgic or technological causes of which we wished to explore.

Regression Analyses

The grouping tests were supplemented with regression analyses, the objective of which was to find the effects of input-type variables on the mechanical characteristics. The standard regression analysis was conducted for the multivariable linear case using the backward elimination method in a way that only the significant members of the so-called optimal regression equation remain. The regression equations are the following:

$HB = 7 + 56*Mn + 990*P + 0{,}046*T_{ö} + 0{,}21*Mg/S$ r=0,808; Sth=7,5
$t_i =$ 18 25 2,7 1,8

$R_m = 398 + 200*Mn + 2650*P + 0{,}074*T_{ö} + 1{,}28*Mg/S - 44*CE$ r=0,768; Sth=25
$t_i =$ 19 20 1,3 3,2 -3,4

$A5 = 47{,}35 - 7*Mn - 82*P - 0{,}010*T_{ö} + 0{,}3*Mg/S - 4{,}0*CE$ r=0,570; Sth=2,6
$t_i =$ -6,3 -5,9 -1,9 7,4 -3,1

The r value indicating the closeness of the regression equation as well as the value of standard error indicating the accuracy of the estimation can be found after each parameter. The Student value (ti) indicating the statistical accuracy of the different coefficients can be seen under the equations, which (with two exceptions) is ti > tkrit (tkrit ~ 2). Due to the above, all the coefficients of the regression equations are significant at a 95% confidence level (the two other members at only a 90% level).

The regression equations show:

– The increase in the Mn- and P-content of the crude iron, as well as that of the casting temperature and the Mg/S ratio increase hardness, tensile strength and reduce normal strain;

– The increase of CE (carbon equivalence) does not affect hardness, but decreases both tensile strength and normal strain.

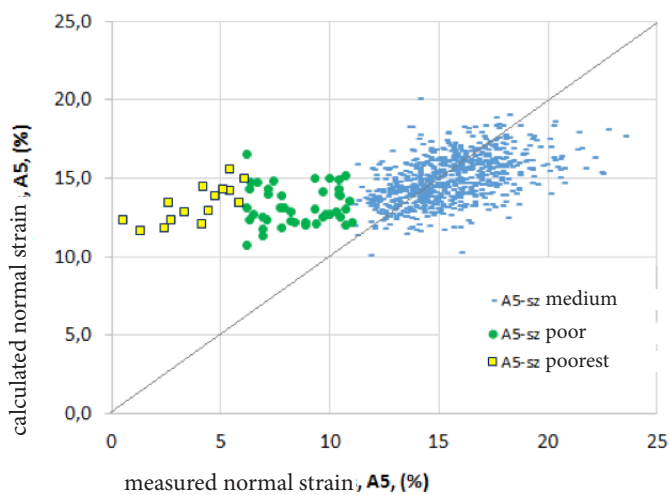
– The other variables included in the research (e.g. tapping temperature, mass of cast material, number of casts) do not affect the above mechanical properties.

– The tests show that it is very likely that the reasons for the mechanical deviations are the deviation from the recommended technological specifications. This means that the mechanical properties can be handled in most of the cases.
– However, due to lack of data, we could not find out what role the time factor may have played in the number of rejects since it was not possible to evaluate the decays.

The testing of the regression equations can be done with their own databases or the comparison with data from other databases. At present, it is only possible to compare them with their own samples. On the basis of the validation, the data calculated from the regression equation are compared to the existing (measured) data. The data will be plotted around a 45 degree line in a x-coordinate system, the more accurate the estimate is, the closer to the line it is.

Figure 6 shows the above example through normal strain. This shows that the regression line showing a weak closeness on the basis of the r=0.57 value gives good estimates in certain ranges, but the 58 deviating figures standing out of the trend show way higher (by the way false) values. In this case the purpose of the preparation of the regression equations is not making an estimate but the explores the errors.

Figure 6. Deviations of the measured and estimated values of standard strain.



Exploration of Reasons for Rejects

The subgroups of the casts examined with different value pairs and showing different mechanical properties do not develop accidentally but through so far only partially known processes during the melting, seeding and casting procedures. We are seeking processes and not really indicators of the condition among the reasons causing decay, most importantly the drop in temperature, Mg evaporation or resulphuration that can be led back to reoxidation. In order to clarify these reasons, the figures of the database broken down into four groups were examined. Omitting the detailed examinations, *Table 1.* shows the arithmetical averages.

Table 1. Mechanical and technological data of different normal strain samples belonging to constant tensile strength.

	A_5 %	Mn %	P %	CE %	Mg/S	$T_{önt}$	T_{csap}
Best strain	17.8	0.264	0.042	4.37	7.24	1380	1504
Normal strain	15.4	0.284	0.042	4.38	6.42	1379	1505
Little strain	7.2	0.315	0.047	4.42	4.11	1386	1504
Least strain	4.5	0.301	0.046	4.43	3.82	1385	1500

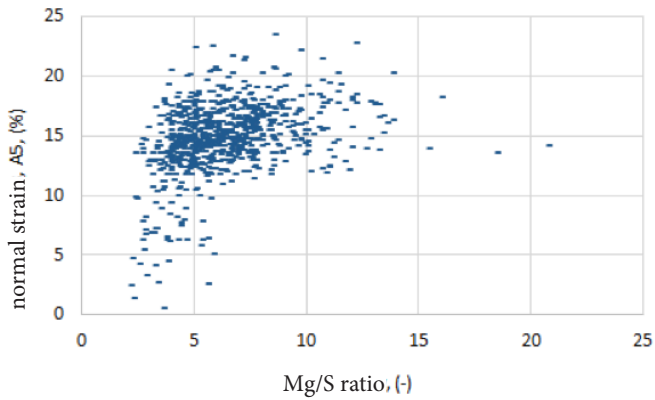
The trends that can be read from *Table 1.* prove useful to describe the deterioration of quality.

The obtained trends confirm the observations in the plant and are in harmony with the results of the regression analyses as well. The most conspicuous is that the least strain is accompanied by the lowest Mg/S ratio.

Of the other factors influencing normal strain, a slight but disadvantageous change in the Mn-, P- and CE-content should be pointed out. The value of tapping temperature can be considered constant for this analysis, while the casting temperature increased by 5 °C. We think the latter figure does not play a significant role in the decrease of the normal strain value. Then we focused our attention on Mg and S.

Among the subsequently prepared S-A5, Mg-A5 and Mg/S-A5 diagrams, neither the S-content nor the Mg-content showed a close correlation that could have led us to the conclusion about some critical threshold value that influences normal strain. These characteristics can only be seen in the Mg/S-A5 diagram, which is shown in *Figure 7.* According to the diagram, if the Mg/S value drops below 6, the proportion of casts showing little normal strain significantly increases, which is usually due to the appearance of abnormal graphite forms.

Figure 7. Correlation between normal strain values and Mg/S ratio.

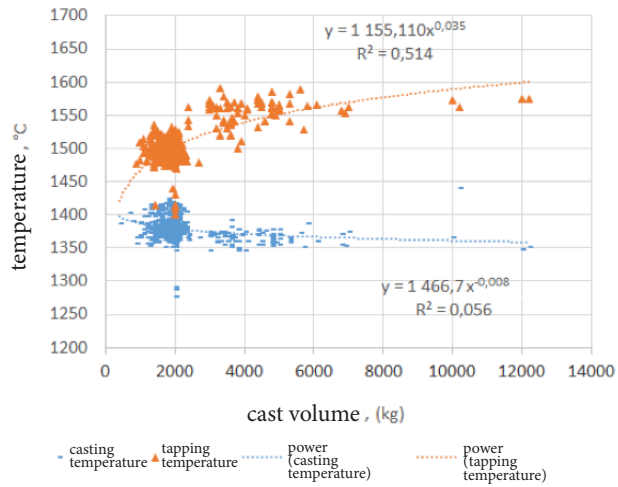


Further on, the database was used to determine the factors influencing the Mg/S ratio. As a result, we managed to clarify the role of the temperature factor. It can be seen that neither the value of the sulphur-content nor that of the magnesium-content depends on the tapping or casting temperatures. This means that the role of iron temperature was successfully excluded from among the reasons for rejects accompanied by a drastic fall in normal strain.

In other respects, even as regards the indirect causes, the value of iron temperature shows a typical behaviour. *Figure 8.* shows that the temperature following the tapping depends on how much the tapped liquid mass is, that is, how big the mass of the cast is. As a result, the casting temperature was typically around 1340 and 1420 °C. [3]

[3] Csepel Metall Kft. (2015): *LC olvasztási napló.*

Figure 8. Correlations between the cast mass and the temperature conditions.



After having the temperature excluded, there are several factors that influence the Mg/S ratio. It is reoxidation starting during the casting process that should be primarily considered, as a result of which

$$MgS + FeO = FeS + MgO \quad (1)$$

the iron melt is resulphurized due to the above process. The speed and extent of sulphur absorption during the casting are issues of further fine tuning, which depend on both balance and time.

Another obvious reason may be the lack of accurate measurement of the rich alloy. In order to accurately determine the quantity of the seeding material, it is essential to know the mass of the iron melt, its sulphur content and the seeding loss. It is important to ensure that the seeding technology and the seeding material are constant.

Recommendations

In order to reduce the number of rejects and other nonconformities in Csepel Metall Ltd in the field of nodular graphite cast iron manufacturing, we have the following recommendations on the basis of our analysis:

– A direct recommendation is that the instructions of the manufacturing process should be reviewed with special view to ensuring the constant Mg/S ratio.
– It is advisable to introduce the time dependent measurement of the temperature of the iron in the casting ladle and register the values.

Our recommendations to improve the general accuracy of the manufacturing processes and manufacturing culture are the following:
– It would be advisable to further develop the database available at the company to add data processing functions to it in addition to the already existing logging functions. Date-based tracking would be suitable for this.
– It would be advisable to add variables such as the type of test (Y or one-piece); standard wall thickness of the piece; time passed since seeding; casting temperature and time of the different pieces; mass of casting ladle.
– It would be advisable to re-examine the values of the parameters recommended in *Table 1*, with special view to the S, Mg and CE values.
– Events such as chill iron charging in the casting ladle should also be registered.
– Metallographic data should also be included in the database.
– After having the new extended database developed, the SPC method should be introduced and applied.
– Through the fine tuning of the manufacturing process, the company may prepare the way for the manufacturing of higher-strength and thus more profitable qualities.

Summary

Through the examination of the database of nodular graphite cast iron manufacturing, the authors tried to establish which are the shortcomings that result in rejects attributed to low standard strain. On the basis of their tests, the most important factor that caused rejects was the Mg/S ratio.

By exploring the problems, the authors help with the manufacturing of casts with more accurate mechanical characteristics and higher profitability.

PÉTER BERECZKI *–VIVIEN GALGÓCZI **

Analysis of the mechanical properties of dual phase steels of different technological conditions

Abstract: In the course of this research work we determined and compared the strength and ductility indexes of plates made from our own alloy design using preliminary hot and then different types of cold rolling with intercritical tempering into the texture suitable for the DP and TRIP standards. First hot rolled sheet bars were produced from small billets made on a dual roll mill stand through precision casting under laboratory conditions, using and following a specific rolling schedule, some of which were later cold rolled to different extents. The texture of the plates complying with DP and TRIP steels was created using the combination of intercritical tempering in a Gleeble 3800 physical simulator then controlled temperature conductivity cooling. The tensile tests of the heat treated pieces and the hot rolled hypopearlitic steel reference specimens were also conducted in a Gleebele simulator. According to our results both the DP and TRIP steel types it is the 20% preliminary cold rolling that ensures the highest strength. Although this extent of cold rolling decreases the breaking strain in the case of the DP steel, it does not influence contraction, while in the case of TRIP steel, a significant increase in strength is realised with retaining the ductility characteristics typical of the hot rolled condition. In addition, significant work-hardening capacity was found in the cases of both steel types, which is shown by the magnitude order of nearly 2 of the Rm/Rp0,2 ratio.
Keywords: Cold rolling, heat-treated plates, rolling schedule, reference specimen, tensile test, work-hardening capacity.

Összefoglalás: Jelen kutatási munkában saját tervezésű ötvözetekből, előzetes meleg-, majd különböző mértékű hideghengereléssel készült, interkritikus lágyítással DP- és TRIP-állapotnak megfelelő szövetszerkezetre hőkezelt lemezek szilárdsági és alakíthatósági mérőszámait határoztuk meg és hason-

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lítottuk össze. A precíziós direktöntéssel gyártott kisbugákból előbb laboratóriumi körülmények között, duó hengerállványon egy meghatározott szúrásterv szerinti meleghengerléssel előlemezeket állítottunk elő, amelyek egy részét a továbbiakban különböző mértékben hidegen hengereltük. A lemezek DP- és TRIP-acélnak megfelelő szövetszerkezetét Gleeble 3800-as fizikai szimulátorban végrehajtott, interkritikus lágyítás majd szabályozott hőmérsékletvezetésű hűtés kombinációjából álló hőkezeléssel hoztuk létre. A hőkezelt darabok és a melegen hengerelt, ferrit-perlites szövetű referencia-próbatestek műszerezett, szobahőmérsékletű szakítóvizsgálatait szintén a Gleeble-szimulátorral végeztük el. Eredményeink szerint mind a DP-, mind pedig a TRIP-acélunk esetében a 20%-os előzetes hideghengerlés biztosítja a legnagyobb szilárdságot. Az ilyen mértékű hideghengerlés a DP-acél esetében ugyan csökkenti a szakadási nyúlást, azonban a kontrakciót gyakorlatilag nem befolyásolja, míg a TRIP-acélnál a jelentős szilárdságnövekedés a melegen hengerelt állapotra jellemző alakíthatósági tulajdonságok megtartása mellett valósul meg. Emellett mindkét acéltípusnál jelentős keményedőképességet tapasztaltunk, amely az Rm/Rp0,2 hányados közel kettes nagyságrendjében is megnyilvánul.

Kulcsszavak: Hideghengerelés, hőkezelt lemezek, szúrásterv, referencia-próbatestek, szakítóvizsgálat, keményedőképesség.

Introduction

Nowadays users have more and more complex and industry-specific requirements as regards the properties of metals and alloys used in engineering structures. As regards the automotive industry, for example, high strength, good or excellent ductility and proper weldability are the set of properties that are considered almost indispensable. In order to meet these types of requirements, the steel industry has developed several steel types based on different metallographic mechanisms. A collective term used for them is AHSS (Advanced High Strength Steels). This group includes HSLA (High Strength Low Alloy), baintic, PH (Press Hardening) and multi or complex-phase (CP – Complex-Phase) steels. [1, 2]

The two probably most widespread types of the steels belonging to the multi-phase steel types are the DP (Dual Phase) and the TRIP (TRansformation Induced Plasticity) steels. As regards their microstructure, dual phase steels can be considered a composite formed by the two phases, in which the main component is ferrite,

[1] Jeanneau, M.–Pichant, P. (2000): The trends of steel products in the European automotive industry. *La Revue De Metallurgies – CIT*. Pp. 1399–1408.

[2] Takehide, S. (2001): Physical Metallurgy of Modern High Strength Steel Sheets. *ISIJ International.* 41(6). Pp. 520–532.

while the second phase is martensite, which is located in the base matrix dispersed, retiform or together with the ferrite in a duplex structure. The ratios of the phases may vary on a wide range, however, the most common varieties contain 15–20% martensite and 80-85% ferrite. The structure of TRIP steels is made up of three main components, ferrite, bainite and residual austenite, whose proportions are typically 50–60%, 25–45% and 5–15%. A common property of both steel types is that the simultaneous presence of the harder an softer phases making up their structure results in significant work-hardening capacity and excellent ductility, as a result the alteration capabilities of the sheets used in the automotive industry needed for the plastic shaping can be ensured, which is accompanied with high strength achieved at the end of the shaping process. This is especially true of TRIP steels, in which the residual austenite oversaturated in the carbon becomes martensite as a result of plastic shaping. [3, 4]

As regards their chemical composition, similarly to structural steels, both steel types are essentially C-Mn-Si/Al alloys, however, their Mn, Si and Al contents are higher than that of the above ones. The above mentioned components are of high importance from a manufacturing process point of view. As regards the technological variants, both steel types are manufactured on hot-rolling mills or from cold rolled sheets on strip annealing or dip-galvanizing lines. A common property of the two technological methods is that in an interim step, in the so-called intercritical range, a heterogeneous texture containing ferrite and austenite is created, from which, using different cooling strategies, the microstructure corresponding to the DP and TRIP standards is created. However, pearlite formation, that is the start of carbide formation, has to be avoided in order to achieve this. The above mentioned components increase the stability of the ferrite as well as the solubility of carbon in austenite, thus hindering carbide precipitation and increasing the hardenability of austenite. Taking the cooling capacity of the production line into consideration, the manganese content was determined at 2–2.5%, while the silicon content at 1–1.5%. Nb-Ti microalloying is also used, which results in a further increase in strength without significant reduction in the ductility properties. [4, 5]

Several studies deal with the examination of DP and TRIP steels. In most of the experiments the two- or three-component texture is created by using

[3] El-Sesy, I. A.–El-Baradie, Z. M. (2002): Influence carbon and/or iron carbide on the structure and properties of dual-phase steels. *Materials Letters.* 57. Pp. 580–585.

[4] Hofmann, H.–Mattissen, D.–Schaumann, T. W. (2009): Advanced Cold Rolled Steels for Automotive Applications. *Steel Research International.* 80. Pp. 22–28.

[5] Oliver, S.–Jones, T. B.–Fourlaris, G. (2007): Dual phase versus TRIP strip steels: Microstructural changes as a consequence of quasi-static and dynamic tensile testing. *Materials Characterization.* 58. Pp. 390–400.

[6] Movahed, P.–Kolahgar, S.-Marashi, S. P. H.–Pouranvari, M.–Parvin, N. (2009: The effect of intercritical heat treatment temperature on the tensile properties and work hardening behavior of ferrite–martensite dual phase steel sheets. *Materials Science and Engineering A*. 518. Pp. 1–6.

[7] Huseyin, A.–Havva, K. Z.–Ceylan, K. (2010): Effect of Intercritical Annealing Parameters on Dual Phase Behavior of Commercial Low-Alloyed Steels. *Journal of Iron and Steel Research, International.* 17(4). Pp. 73–78.

[8] Gündüz, S. (2009): Effect of chemical composition, martensite volume fraction and tempering on tensile behaviour of dual phase steels. *Materials Letters.* 63. Pp. 2381–2383.

[9] Meng, Q.–Li, J.–Wang, J.–Zhang, Z.–Zhang, L. (2009): Effect of water quenching process on microstructure and tensile properties of low alloy cold rolled dual-phase steel. *Materials and Design.* 30. Pp. 2379–2385.

[10] Sodjit, S.–Uthaisangsuk, V. (2012): Microstructure based prediction of strain hardening behavior of dual phase steels. *Materials and Design.* 41. Pp. 370–379.

[11] He, Z.–He, Y.–Ling, Y.–Wu, Q.–Gao, Y.–Li, L. (2012): Effect of strain rate on deformation behavior of TRIP steels. *Journal of Materials Processing Technology.* 212. Pp. 2141–2147.

[12] Curtze, S.–Kuokkala, V. T.–Hokka, M.–Peura, P. (2009): Deformation behavior of TRIP and DP steels in tension at different temperatures over a wide range of strain rates. *Materials Science and Engineering A*. 507. Pp. 124–131.

heating from room temperature with the above mentioned intercritical annealing and the subsequent intensive cooling. In a part of the researches the effects of the parameters of intercritical annealing and the conditions of cooling [6, 7] as well as the subsequent draw-back [8] texture and mechanical properties are examined.

Another part of the studies examine the effect of forming in the intercritical range and the recrystallization of the different phases on the properties of the end product [9], and analyses the connection between the different properties of the macrostructure and the macroscopic deformation mechanisms. [10, 11]

A common characteristic of the reference analyses is that they study the mechanical properties of DP and TRIP steels using tensile strength tests in some cases in a very wide speed and temperature ranges. [12] In this research we also studied the mechanical properties of a DP and a TRIP steel using tensile strength tests, however, depending not on the previously tested technological data, but on the extent of preliminary cold-rolling.

Manufacturing of Experimental Alloys and Production of Differently Formed Reference Pieces

We used the Mn-Si-Al alloy DP and TRIP steel qualities made with the alloying methods mentioned in the introduction for our deformation experiments. Both steel types were produced using precision direct casting in the form of small cylindrical and prism-shaped billets.

The smelting and alloying necessary for casting was done in top feeding inductive ladles. We employed argon protection gas at the top and bottom parts of the ladles in order to reduce melting loss.

The quantity of components was calculated for a 60 kg input system in a way that the quantity of aluminium – as a deoxidizing agent – should be minimal in the prepared alloy. During the sampling after the alloying, homogenizing and casting the chemical composition of the casts was checked with a SpektroLab M100 optical emission spectrometer. The nominal size of the prism-shaped casts used in our experiments further on was approximately 20x20x215 mm, and their chemical percent composition by mass (m/m%) is included in *Table 1*.

Table 1. Chemical composition of casts corresponding to DP and TRIP steel standards.

m/m %	C	Mn	Si	S	P	Cr
DP	0,152	1,85	0,494	0,015	0,009	0,026
TRIP	0,183	2,33	2,02	0,015	0,011	0,033
m/m %	Ni	Al	Ti	V	Mo	Nb
DP	0,014	0,044	0,062	0,002	0,001	0,011
TRIP	0,018	0,004	0,033	0,002	0,002	0,011

In order to achieve the research objectives mentioned in the introduction, we need DP and TRIP sheets deformed to different degrees. In the first step the cast structure with a square cross-section needed to be homogenized. To homogenise and produce sheet test products resembling the sheet test specimens, we produced sheet bars from the casts using hot rolling. After determining the rolling pass schedule and performing the hot rolling, the pieces meeting the requirements of DP and TRIP steel standards but still in hypopearlitic steel form were produced by cold rolling the approximately 6 mm sheet bars to different extents.

Determining the Hot Rolling Pass Schedule

In order to determine the rolling pass schedule of hot rolling, we first specified the thickness of the sheet bar to be produced by the end of the rolling process. The thickness of the case sample is about H0=20 mm. The thickness of the sheet bar was specified as H_v= 6 mm considering the fact that incorrect shapes after hot rolling had to be taken off, and cold rolling causes draught. Using the initial and final thickness figures, the equivalent representative logarithmic strain, that is, the total change of form ($\varphi_{ö}$) achieved during the rolling process can be calculated using the following relationship:

$$\varphi_{ö} = \ln\left(\frac{H_o}{H_v}\right) = \left(\frac{20}{6}\right) \cong 1{,}204 \tag{1}$$

Considering the size of the total change of form, the whole rolling process was divided into six passes in accordance with the extent of representative logarithmic strain $\varphi^{(i)}$ by pass as shown in *Table 2*. According to the planned pass schedule, the extent of plastic deformation by step is the lowest during the first, initial pass, while the highest in the second pass in order to start recrystallization. The extent of plastic deformation continuously decreases in the subsequent rolling steps. Using the $\varphi^{(i)}$ values, the interstage thickness of the sheet bar after the *i-th* pass can be calculated using the following relationship:

$$\ln\left(\varphi^{(i)}\right) = \frac{H_0^{(i)}}{H_v^{(i)}} \rightarrow H_v^{(i)} = \frac{H_0^{(i)}}{e^{\varphi^{(i)}}} \tag{2}$$

where: $H_0^{(i)}$ the thickness of the sheet bar before the *i-th* pass [mm];
$H_v^{(i)}$ the thickness of the sheet bar after the *i-th* pass [mm].

Using the thickness figures determined with the above formula, it is easy to calculate the extent of the draught ($\Delta H^{(i)}$) in the different passes, on the basis of which the size of the roll gap can be adjusted. (*Table 2)*. The increasing representative strain rates ($\varphi^{(i)}$) planned for the different rolling stages are also included in *Table 2*. For the calculation of the roll rotation speed to be set on the rolling mill, in addition to the strain rate and $\Delta H^{(i)}$ draught, the mean gauge number and the length of the rolled camber have to be specified for each pass. The $H_k^{(i)}$ mean gauge number in the i-th pass can be calculated with the following formula:

$$H_k^{(i)} = \frac{H_o^{(i)} + H_v^{(i)}}{2} \tag{3}$$

length $l_d^{(i)}$ of the rolled camber in the *i*-th pass:

$$l_d^{(i)} = \sqrt{R \cdot \Delta H^{(i)}} \tag{4}$$

where: *R* diameter of the working roll [mm].

The representative strain rate typical of the rolling of flat sheets can be calculated using the following relationship, roll rotation speed in the *i*-th pass:

$$\dot{\varphi}^{(i)} \cong \frac{\Delta H^{(i)}}{H_k^{(i)}} \cdot \frac{v_h^{(i)}}{l_d^{(i)}} \longrightarrow n^{(i)} \cong \dot{\varphi}^{(i)} \cdot \frac{H_k^{(i)}}{\Delta H^{(i)}} \cdot \frac{1000 \cdot l_d^{(i)}}{2R \cdot \pi} \qquad (5)$$

where: $v_h^{(i)}$ peripheral speed of roll in i-th pass [m/min];
$n^{(i)}$ roll rotation speed in the i-th pass.

The above specified technological data of hot rolling are summarised in *Table 2*. Before each pass, the values in bold in the table were set on the Von Roll dual roll mill stand, that is the extent of draught and the roll rotation speed were set.

Table 2. Data of hot rolling pass schedule.

Number of pass	**Representative logarithmic strain, $\varphi^{(i)}$[-]**	**Sheet bar thickness after pass, $H_v^{(i)}$ [mm]**	**Draught, $\Delta H^{(i)}$ [mm]**
1.	0.13	17.6	**2.4**
2.	0.24	13.8	**3.8**
3.	0.22	11.0	**2.8**
4.	0.23	8.8	**2.2**
5.	0.21	7.1	**1.7**
6.	0.17	6.0	**1.1**
Number of pass	**Representative strain rate, $\dot{\varphi}^{(i)}$ [1/s]**	**Peripheral speed of roll, $v_h^{(i)}$ [m/min]**	**Roll rotation speed, $n^{(i)}$ [1/min]**
1.	1.5	11.4	**16.4**
2.	2.8	14.3	**20.7**
3.	4.1	19.3	**27.9**
4.	5.4	22.4	**32.3**
5.	6.7	25.9	**37.6**
6.	8,0	31.3	**45.3**

Determining the Temperature Conductivity of Hot Rolling

The temperature conductivity of hot rolling was adjusted to the six planned passes. The austenitizing of the casts before rolling was done in two laboratory furnaces which can be programmed up to 1,200 °C. Due to the low alloy element content of our casts, to avoid the grain coarsening of the austenite, the temperature of austenitizing for the DP steel was 1060 °C, and 1080 °C for the TRIP steel, with a 30-minute austenitizing period in both cases. Due to the number of passes and the small size of the workpieces, the sheet bars were expected to cool down too much, and the allotropic transformation was expected to start even before the end of the rolling procedure. In order to avoid this, the sheet bars were placed back and reheated in the furnace for 15 minutes between passes 3 and 4. In order to avoid their lateral distortion, the sheet bars, which were elongated between passes 4 and 5, were cut in half. As regards the working sequence of hot rolling, all the casts, 4–4 for all the material qualities, were rolled in a single pass using the roll gap and roll rotational speed set before the individual passes, then all the pieces were placed back in the furnace while the draught and rotational speed for the next pass were set. The temperature (T_{out}) of the sheet bars coming out from between the rolls was measured with an infrared pyrometer. The following table summarises the planned and measured temperature values of the hot rolling of the DP steel samples. The T_{nom} temperature is the nominal one set on the furnace, while $T_{furnace}$ is the actual smelting chamber value measured by the thermo-element of the furnace.

Table 3. Hot rolling temperature conductivity for DP steel quality

		Pass 1	**Pass 2**	**Pass 3**	**Intermediate operation**
Austenitization: 30 min, 1060°C	Workpiece	T_{out}	T_{out}	T_{out}	Reheating: 15 min, 1040°C
	1st	930	949	950	
	2nd	956	956	952	
	3rd	954	968	929	
	4th	972	974	937	
	T_{nom}	1060	1060	1060	
	$T_{furnace}$	1055	1035	1012	

	Pass 4	**Intermediate operation**		**Pass 5**	**Pass 6**
Workpiece	T_{ki}	Cutting with sheet shears	Workpiece	T_{out}	T_{out}
1st	930		1. db	892	899
2nd	922		2. db	890	891
3rd	901		3. db	895	897
4th	906		4. db	960	870
T_{nom}	1040		5. db	890	910
$T_{furnace}$	1032		6. db	885	896
			7. db	875	882
			8. db	875	867
			T_{nom}	1040	1040
			$T_{furnace}$	1015	985

After the last pass, the sheet bars were cooled slowly, under sand. After having the hot rolling finished, we had 8–8 pieces of sheet bars of about 6 mm in thickness corresponding to the DP and TRIP steel chemical composition standards, but of hypopearlitic steel texture at the time.

Cold Rolling of Sheet Bars to Different Extents

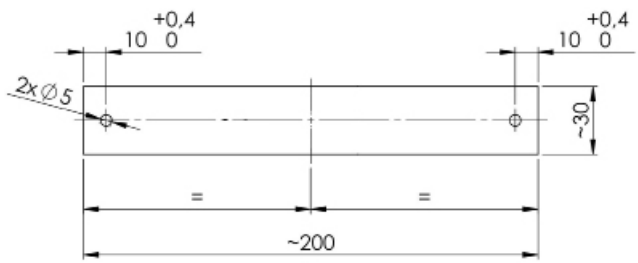
Before cold rolling the sheet bars to different extents, due to the limited different load capacity of the experimental mill stand, the 6 mm thickness obtained during hot rolling had to be reduced. Using sand blasting, the gauge of all 16 sheet bars was reduced to ~2.5 mm. One test specimen of each material quality went under cold rolling resulting in 10, 20, 30, 40 and 50% nominal draught, each pass reducing the actual thickness of the sheets by 10%. After having the sheets rolled, and the edges cut, we obtained strips of different thickness and about 200x30 mm in size. *Table 4* shows the resultant gauge of the sheets, which were cold rolled to different extents. The data represent the average gauge referring to the two material qualities.

Table 4. Average final gauge values of cold rolled sheets.

Extent of cold rolling [%]	10	20	30	40	50
Gauge after shaping [mm]	2.25	2.03	1.78	1.48	1.18

In addition to the 5 pairs of sheets cold rolled to different extents, we also made 2 pieces of only hot rolled strips of each material quality measuring 200×30×2.5 mm. From the 5–5 pieces of hot rolled, then cold rolled, and the 1–1 pieces of only hot rolled sheets, the test specimens shown in the figure below were created. The texture corresponding to the DP and TRIP standards on these tests specimens with boreholes was created using the heat-treatment unit of the Gleeble 3800 thermomechanical simulator operating at the College of Dunaújváros *(Figure 2(b)*).

Figure 1. Shop drawing of test specimens used to create the texture corresponding to DP and TRIP standards.



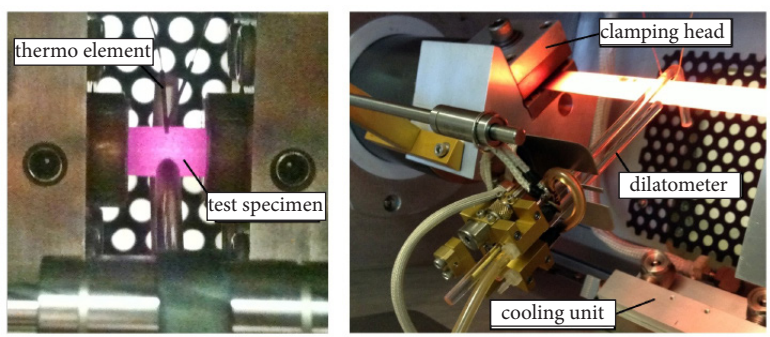
There was no heat treatment done on the remaining pieces of hot rolled strips of different material quality that was aimed at modifying the texture. Room-temperature tensile tests were conducted on these pieces as hypopearlitic texture reference samples.

Adjusting the Texture of Sheet Test Specimens

Of the manufacturing processes types of DP and TRIP steels mentioned in the introduction, we used the technique of intercritical annealing from room temperature in order to produce dual and multiple texture microstructures in this research. In order to produce the texture corresponding to the DP and TRIP

standards, first we had to determine the intercritical temperatures where at the given heating rate the austenite-ferrite ratio is 20–80% in the material that is of DP steel quality, and 45–55% in the material that is of TRIP steel quality. In order to achieve this, we produced cylindrical test specimens of Ø10×15 mm, which underwent a dilatometer phase transition analysis. During the simulation performed as shown on *Figure 2(a)* in a Gleeble simulator, the test specimen was heated at 0.5°C/s up to 1,000 °C, then following a 10s holding, it was freely cooled to room temperature. During the simulation, the changes in the diameter of the test specimen were measured with a dilatometer of 1 μm definition on cross-sections identical to the thermos elements.

Figure 2(a) Experimental arrangement of dilatometer phase transformation analysis. (b) Setup of intercritical heat treatment measurements.

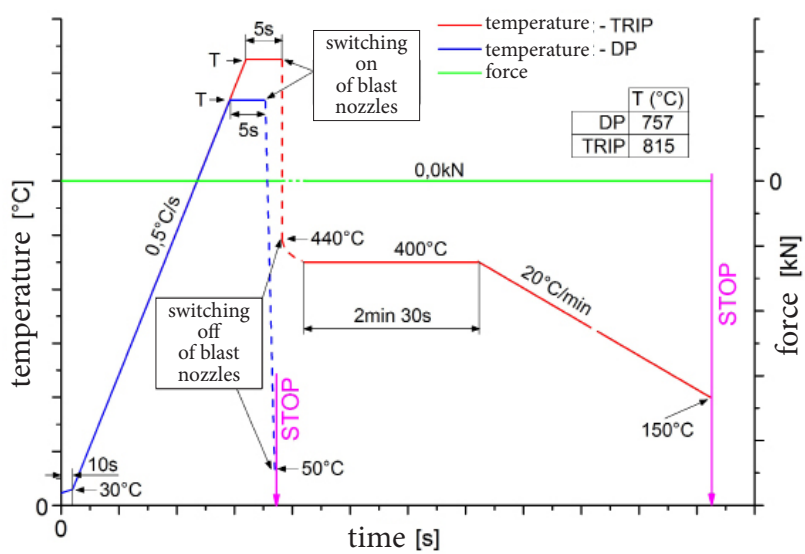


In the thermic system of the Gleeble simulator working with resistance heating, the temperature of the test specimen – through the signal of the pair of thermo elements welded on their surface – can be controlled in a closed, digital control circuit as a function of time. In addition, on the basis of the signals from different measuring apparatuses (transmitter, ductilimeter, load cells etc.) the movements of the working rolls holding the clamping heads can also be controlled. During the phase transformation test, the mechanical system was programmed to maintain a constant -0.5 kN compression load thus compensating for the longitudinal heat expansion of the test specimen. Using the data obtained from the temperature dilatation diagram, dilatogram, plotted from the data sampled during the phase transformation tests, we determined the intercritical temperatures belonging to the mentioned phase ratio for both material qualities. On the basis of our calculations, the intercritical temperature necessary for producing DP steel is 757 °C, while in the case of TRIP steel it is 815 °C. The textures corresponding to the DP and TRIP qualities were produced in the Gleeble simulator using intercritical annealing at these temperatures and the subsequent

one- or multistage cooling during the heat treatment cycles. The pattern of the simulation programme is shown in *Figure 3.* At the beginning of the simulation, the sheets with chemical composition corresponding to the DP and TRIP stanards were both heated up to the mentioned intercritical temperature at a speed 0,5°C/s used at the phase transformation tests. Following a 5s holding at the given isotherm, the tempering stages marked with a broken line on *Figure 3* were done using the air-water spraying equipment shown in *Figure 2(b)*. In the case of the test specimens of DP quality the air-water mix was streamed through the blast nozzles till the temperature of the sheet reached 50 °C, while he programme switched off the heating unit at 440 °C in the case of TRIP sheets, then the thermic system set the temperature of the test specimen at 400 °C by switching on the heating current.

The 400 °C isotherm value necessary for the bainitic transformation was determined on the basis of the composition of the TRIP sheets with the help of the isothermic C-curve determined with the JMatPro software. According to the C-curve, with 150s of holding time, 89% of the 45% of austenite in the texture transforms into bainite, which is 40% of the total volume, that is, approximately 5% of austenite oversaturated with carbon is left by the end of the holding. As a result of the plastic deformation this metastable austenite portion transforms into martensite causing the TRIP effect. After the holding stage, in order to stabilise the remaining austenite, the temperature of the test specimen was reduced using slow cooling (20°C/min) to 150 °C.

Figure 3. Pattern of the intercritical heat treatment simulation programme.



In order to relieve the test specimen during the heating and cooling stages, the mechanical system of the simulator was set at a 0.0kN resultant force value thus compensating for the heat expansion of the sheets.

Performing the Tensile Tests

Following the heat treatment of the sheets to DP and TRIP standards, we had 7 test specimens of different textures for every material quality at our disposal. One of both the DP and TRIP steel qualities underwent hot rolling only, while further one of both types of hot rolled strips were heat treated to DP and TRIP standars. Similarly to this, the five hot rolled and then diversely cold rolled sheets of both types were heat treated to DP and TRIP standards. We planned a geometry for the room temperature tensile test of the 14 sheets of different gauge with which the criteria set for the proportional tensile test specimens (Hungarian Standard MSZ EN ISO 6892-1:2009) can always be met by changing the original gauge length.

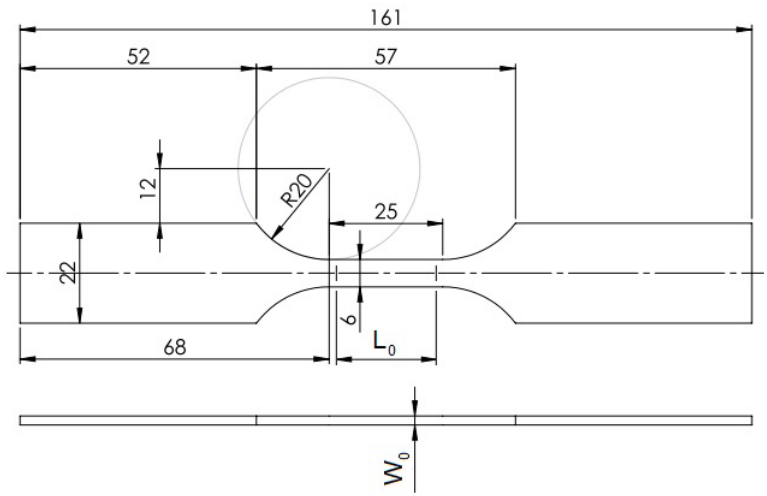
The average sheet gauge (W_0) obtained during the hot rolling and the cold rolling of different extents can be seen in *Table 5*. In order to facilitate the creation of the test specimens, the width of the test section (b_0) was uniformly set to 6 mm. The original cross-sectional area (S_0) is obtained from the two previous sizes by sheet gauge. The value of the original gauge length (L_0) was calculated using the $L_0 = \sqrt{k} \cdot S_0$ relationship, where the value of k factor is 5.65 in the case of a proportional tensile test specimen. The size indicated in the last column of the table is the length of the parallel test section of the specimen (L_c), which, according to the relevant standard, must be at least one and a half times longer than the b0 value of the sheet, the original gauge length. The highest original gauge length was 22 mm, so we chose to have 25 mm for L_c uniformly. The ductilimeter was placed at the originally determined original gauge length during the tensile tests *(see Figure 5)*.

Table 5. Typical sizes of proportional tensile test specimens.

Extent of cold rolling	W_0 [mm]	b_0 [mm]	S_0 [mm^2]	L_0 [mm]	L_c [mm]
0%	2.53	6,0	15.15	22.0	25
10%	2.25		13.5	20.8	25
20%	2.03		12.15	19.7	25
30%	1.78		10.65	18.5	25
40%	1.48		8.85	16.8	25
50%	1.18		7.05	15.0	25

Taking the sizes summarised in the above table into consideration, we worked out the tensile test specimens corresponding to the following shop drawing.

Figure 4. Shop drawing of tensile test specimens.



The tensile tests were also conducted in the Gleeble simulator. As *Figure 5(a)* shows the experimental arrangement, the sheet test specimens placed between four wedge-shaped clamping heads were prestressed with screw nuts, then starting from a load-free position, we turned it till breaking using the $0.00025s^{-1}$ cross-head speed ensuring the standard strain rate. The ceramic parts of the ductilimeter shown in the figure below were always fixed to the test specimens at the original gauge length. The loading force and the values measured by the ductilimeter were registered.

Figure 5. (a) Measuring arrangement of tensile test.
(b) Broken DP test specimens of different starting point.
(MH = hot rolled; HH = cold rolled; DP = dual phase; F+P = hypopearlitic)

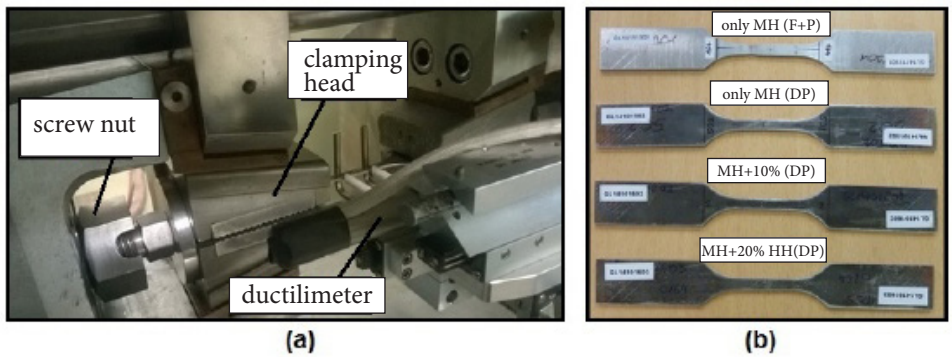


Figure 5(b) shows some test specimens that had undergone a tensile test fit together at their broken cross section. The test specimens marked DP clearly show the fine oxide layer formed after the heat treatment combined with water tempering in the Gleeble simulator.

Conceptual Background of the Evaluation of Tensile Tests

After conducting the tensile tests, we used the sampled data to plot the engineering and actual stress-strain curves by test specimen as well as the proof stress measured in a loaded position and belonging to the 0.2% permanent deformation, the values of tensile strength, breaking strain and contraction. The evaluation was also performed in accordance with the Hungarian Standard MSZ EN ISO 6892-1:2009 about room-temperature tensile tests.

The ductilimeter used during the experiments registered the original gauge length (L_0) tensile strain (ΔL). Using these data and the original gauge length , the extent of the engineering overstrain (ε) can be calculated as follows:

$$\varepsilon = \frac{\Delta L}{L_0} = \frac{L - L_0}{L_0} \qquad (6)$$

where: L momentary gauge length [mm].

The engineering strain (σ) can be calculated with the help of the following relationship as a quotient of momentary force (F) and original cross-sectional area (S_0):

$$\sigma = \frac{F}{S_0} = \frac{F}{W_0 \cdot b_0} \tag{7}$$

The value of actual strain (φ) can be calculated with the help of the following relationship:

$$\varphi = \ln\frac{L}{L_0} = \ln\frac{L_0 + \Delta L}{L_0} \tag{8}$$

It is necessary to know the current width of the test specimen in order to be able to calculate the momentary cross-sectional area, which we could not measure during the tensile tests. Using the principle of volume constancy, we determined the current cross-sectional area from the original gauge length and cross-section as well as the tensile strain of the gauge length, thus the true stress (σ') can be calculated with the help of the following relationship:

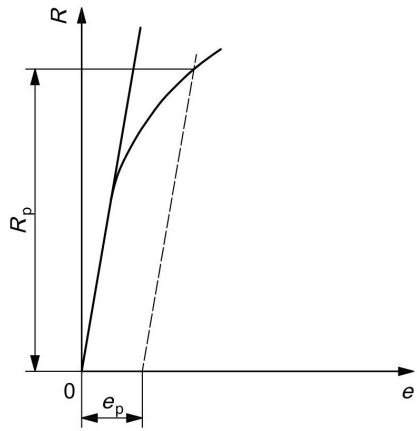
$$\sigma' = \frac{F}{S} = \frac{F}{b \cdot W} = \frac{F \cdot L}{L_0 \cdot S_0} = \frac{F \cdot (L_0 + \Delta L)}{L_0 \cdot S_0} \tag{9}$$

where: S momentary cross-sectional area [mm^2];
b momentary width of the test section of the test specimen [mm];
W momentary gauge of the test section of the test specimen [mm].

Figure 4 shows the design principle of the proof stress belonging to $R_{p0,2}$, that is 0,2% permanent deformation measured in a loaded position. The designing was always done in the engineering strain–engineering overstrain diagram. A line was drawn on the flexible part of the breaking curve, the another line parallel with it intersecting at the 0.002 value, that is, a 0,2% overstrain on the X-axis.

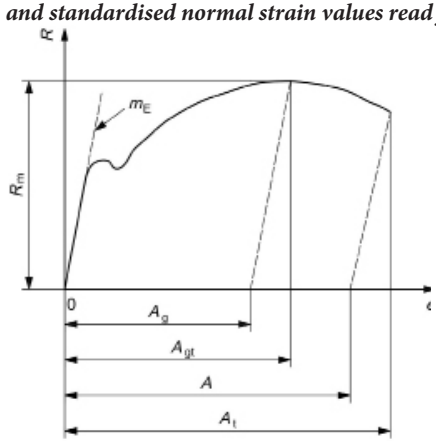
The value of $R_{p0,2}$ is given by the ordinate of the intersection point of the line and the breaking curve.

Figure 6. Design principle of proof stress belonging to 0.2% permanent strain. (e = engineering strain; R = engineering overstrain)



Of the tensile test figures shown on *Figure 7*, we determined the values of tensile strength (R_m) and breaking strain measured in a loaded position (A_t) during this research. Tensile strength is obtained from maximum engineering strain, while breaking strain measured in a loaded position from the engineering overstrain belonging to the last point of the breaking curve.

Figure 7. Tensile strength and standardised normal strain values read from the breaking curve.



Finally, the decrease of cross-section in percentage, that is, the extent of contraction, was determined for each test specimen. Following the axisymmetrical assembling of the broken pieces, the gauge (W_u) and width (b_u) of the test specimen was measured several times in the contraction zone trying to find its minimum value. The contraction is the following:

$$Z = \frac{S_0 \cdot S_u}{S_0} \cdot 100\% = \frac{W_0 b_0 - W_u b_u}{W_0 b_0} \cdot 100\% \qquad (10)$$

where: S_u area of the smallest cross-section of the test specimen measured after breaking [mm²].
S_0 area of the original cross-section of the test specimen [mm²].

Comparison of the Mechanical Properties of DP and TRIP Steels of Different Initial Condition

With the help of the relationships defined in the previous chapter and using the sampled data, the strain curves consisting of the engineering strain–engineering overstrain value pairs was determined for all 14 tensile tests. They are illustrated by the following two figures summarised separately for the DP and TRIP steel qualities.

Figure 8. Breaking curves of DP steel test specimens.

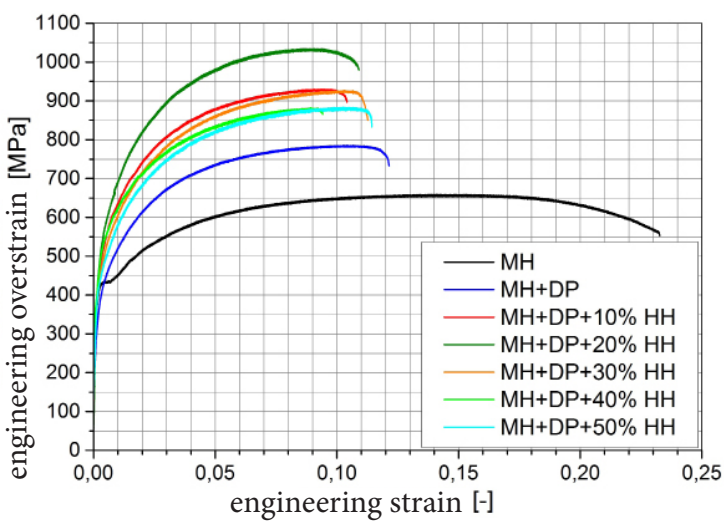
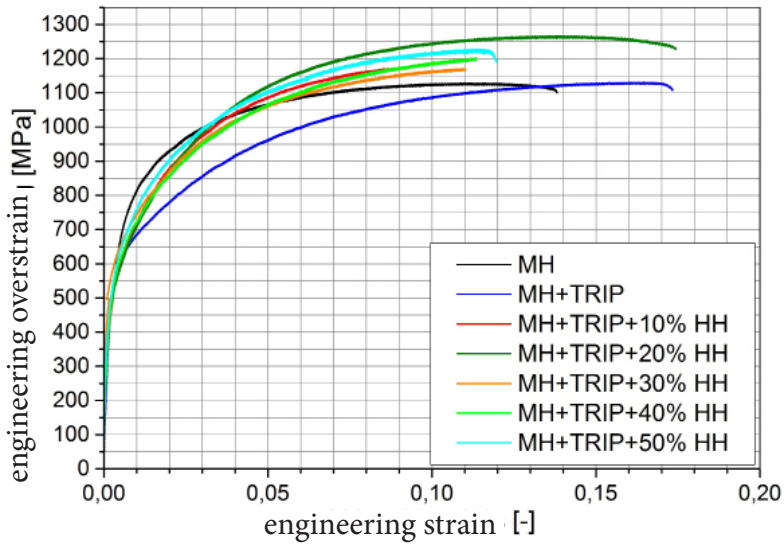


Figure 9. Breaking curves of TRIP steel test specimens.
(MH = hot rolled; HH = cold rolled)



The two figures below show the standardised mechanical index numbers calculated on the basis of the relationships discussed above as a function of the extent of cold rolling separately for DP and TRIP steels. The orange and light blue colours indicate the corresponding index numbers of hot rolled, hypopearlitic texture test specimens in the case of both materials, which were obviously assigned a 0% cold rolling value.

Figure 10. Mechanical index numbers of DP steel test specimens.

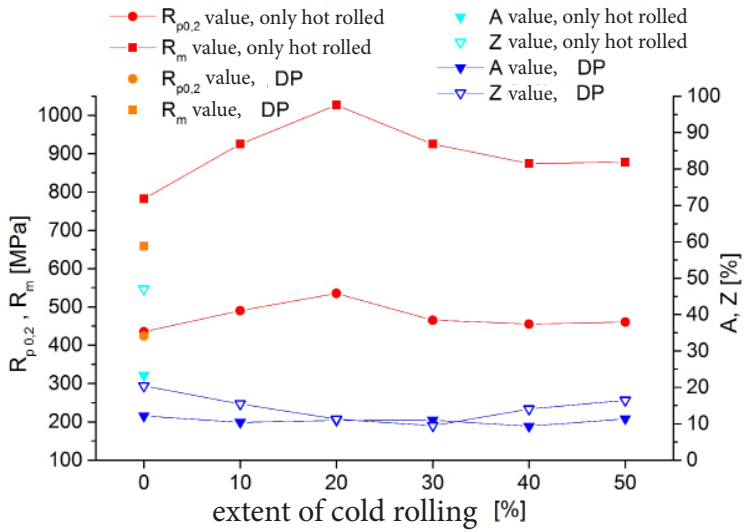
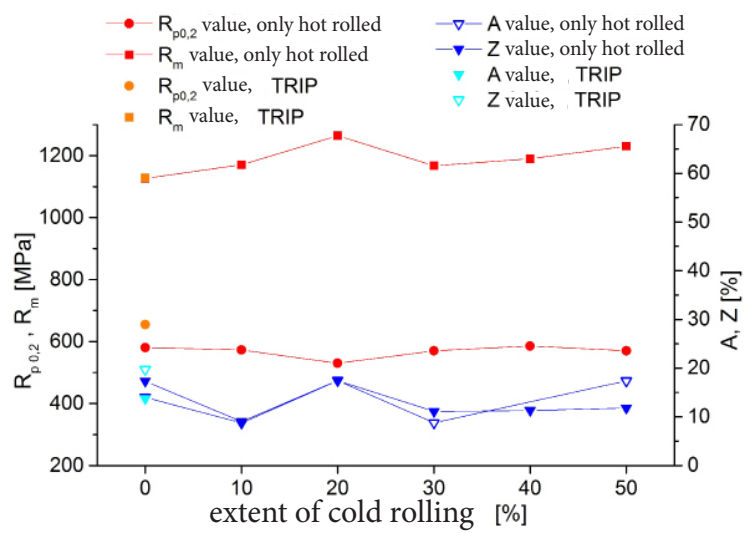


Figure 11. Mechanical index numbers of TRIP steel test specimens determined from tensile tests.



A clear trend of the development of both strength and ductility can be seen in the case of DP steel when the index numbers are examined. The maximum tensile strength and proof stress values were measured in the cases of the test specimen that underwent 20% cold rolling. Cold forming of a smaller or greater extent also slightly increases the above strength index numbers compared to the hot rolled condition, but to a lesser extent. At the same time, in accordance with experience, the value of breaking strain and contraction, that is, the ductility of the material, changes in the inverse ratio compared to the strength properties, and is the lowest in the case of the 20% cold rolling. When the strength values of the reference hot rolled hypopearlitic textured test specimen and those of the DP textured specimen undergoing 20% cold forming are compared, it can be seen that while the yield point increased by nearly 30%, the tensile strength almost doubled. In addition, the breaking strength dropped nearly by half, however, the extent of contraction did practically not change.

No clear correlation can be seen between the mechanical index numbers of TRIP test specimens and the extent of cold rolling. However, when the values of proof stress and tensile strength are compared, it can be seen that the $R_m/R_{p0,2}$ quotient is nearly two in the case of almost all test specimens, which confirms the excellent work-hardening capacity of the steel we produced. It was the 20% preliminary cold rolling that resulted in the highest tensile strength in the case of TRIP test specimens as well, which exceeded 1260 MPa. In addition, as opposed to what was seen in the case of DP steel, the values of breaking strain and contraction remained at approximately 20%, which practically is the same as the ductility index numbers of the hot rolled, hypopearlitic textured test specimen. It is an interesting result that the proof stress of TRIP textured test specimens practically does not depend on the extent of preliminary cold rolling, and in every case is lower than the proof stress measured in the hypopearlitic condition.

All in all, it can be stated that it is the cold rolling resulting in 20% draught that ensures the best strength properties before the intercritical heat treatment in the case of both DP and TRIP steels, and it does not even deteriorate ductility in the case of TRIP steels.