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SMART CONTROL OR DESIGN IN THE FACE OF THE MISUSE OF SMARTPHONES BY PUPILS

Art research paper

Contents

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Abstract

The article addresses the topic of the misuse of mobile phones by pupils at school and presents, as a response to this phenomenon, an original project from the field of mindful design. In line with the idea of empathetic design, the authors study the difficulties and needs of pupils and teachers in order to accurately identify the core of the problem. They confront the questions – arising from the chosen design path marked by empathy – which accompanied them during several months of work. Do pupils recognise the problem of the misuse of smartphones at school? Does this issue also affect teachers, and if yes, to what extent? What emotions accompany them? Does external control effectively counter the problem? What design methods and solutions can be applied in effective media education? Drawing on sound research, reports and educational projects, the designers critically analyse the misguided tools and methods, used in existing solutions, as well as the good practice. They combine knowledge from the fields of contemporary education, psychology and design using new technologies. They seek to identify the optimal way to counteract pupils' destructive digital media habits by presenting a solution from the field of mindful design developed on the basis of contemporary research and educational premises.

Keywords

empathetic design, *mindful design,* smartphone in school, efficiency, interpersonal interactions among pupils, self-monitoring, intrinsic motivation, Faraday cage, gamification, *team-based learning*, behavioural design, interaction, hybrid design

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The misuse of smartphones by pupils is a rampant phenomenon in the school environment, and the subject of several discussions and disputes. It is not difficult to see that this phenomenon has a negative impact on pupils' interpersonal relations, concentration or relationships with teachers. It is also impossible to ignore the long-term negative effects of the misuse of mobile phones, linked to the dangers of the internet, i.e. phonoholism or cyberbullying, which have further consequences that disrupt the psycho-physical well-being of pupils. Both the issue itself and the scale of its impact on the school environment are well known to the authors of this article; the first fruit of their exploration of this topic is the prototype of the OFF DESK interactive desk for the youngest, which rationalises smartphone use (designed as part of the master's thesis of one of the authors with the supervision of the other). This school desk is equipped with a Faraday cage designed to store a mobile phone during lessons. By generating audio-visual impulses when the smartphone from the Faraday cage is put down or taken out, the desk stimulates the child to learn and work. The idea behind OFF DESK oscillates around struggling with the problem of reduced efficiency caused by the unwise use of mobile devices. The major aim is to get the youngest users into the habit of putting the smartphone away while they are at school and work, in order to avoid the problem of unwise use of mobile devices in their later life.

Fig. 1. OFF DESK, photo: M. Płachetka.

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Fig. 2. OFF DESK detail, photo: M. Płachetka.

The confrontation of the above prototype project with the school environment, as well as the qualitative research conducted jointly by the authors of the article, inspired them to a further design process, resulting in the solution called SMART CONTROL described in the present article.

This qualitative research consisted of a series of in-depth interviews with three pupils, four female teachers and four female headmistresses, conducted either by video interview or within a real-life meeting. The interviews were problem-based and empathy-driven. They were conducted in the form of an open, natural conversation. They consisted of a number of main questions about problems, needs, attempts made to solve difficulties and the interviewee's feelings and opinions on the subject, as well as follow-up questions that deepened the intriguing topic. The questions directed at the pupils focused on efficiency and concentration during lessons, as well as the pupils' interpersonal relationships. Teachers were asked about their teaching and classroom experience, while headmistresses were asked about the organisation of their classes and the biggest problems perceived among pupils. In every interview, the topic of smartphones – considered both as a problem and pupils' primary leisure tool – came up.

The interdisciplinary and empathetic approach to the problem resulted in an interesting design process, full of twists and turns, as well as confrontations with people representing different positions, all connected to the school or digital environment. Several months of work brought the design of an interactive piece of school furniture, accompanied by a scenario from the field of media education, which will be presented in detail in the final part of the article.

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Empathy in design

Design today is no longer seen only through the prism of aesthetic qualities and usability. User emotions are increasingly important. Beauty and utility are not the only qualities of utilitarian objects; the ability to understand behaviour and social patterns is gaining in importance.

This applies to utilitarian objects as well as architecture, interior design, landscape or other creative activities. Empathy became the foundation to build exceptional design solutions. As Victor Papanek mentions, the designer should be guided by empathy at every stage of creation, both at the beginning: during the initial discussions with audiences, users and other stakeholders about their problems, needs and feelings, and at the later design stages, where the ability to understand the emotions and behaviour of potential users interacting with the final product must be demonstrated. The emotional sphere of the user, the way they interact with the object and the psychophysical properties of the product, is important in the reception of designed objects. Having taken these values into account, the designer can influence any audience in the chosen way.[1]

Fig. 3. Pupils towards smartphones, source: https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

Pupils towards smartphones

The dangers related to the unwise use of smartphones primarily affect primary school pupils (grades 4–8) and secondary school pupils. According to the Sensory Suggestibility Test (SST) scale formulated by Gheorghiu, Hodapp & Lidwig in 1975,[2] younger people are characterised by greater susceptibility to media influence than adults.[3] The seriousness of the problem is fuelled by the fact that these people are at the stage of adolescence, i.e. the period when they build valuable relationships, form their worldview and lifestyle. The attitude of rebellion against the rules in force, typical for this group, also plays a significant role. Any bans are seen as an attack on personal freedom and therefore fail as

1 D.A. Norman, *Wzornictwo i emocje. Dlaczego kochamy lub nienawidzimy rzeczy powszednie*, Warszawa 2015.
2 R. Polczyk, *Skala Sugestybilności Sensorycznej — narzędzie do badania podatności na sugestie*, E. Zdankiewicz-Scigała, T. Maruszewski, *Wokół psychomanipulacji*, Warszawa 2003
3 B. Kozaczuk, *Wykorzystywanie wizerunku jednostki w celu intencjonalnego oddziaływania na dzieci i dorosłych*, Warsaw 2011, https://czasopisma.ignatianum.edu.pl/eetp/article/view/855/944 [accessed: 29/03/2022].

a method of combating the misuse of smartphones at school. Given that "the average age of starting to use one's own mobile phone regularly is 10 years, and 7–8 years in large urban areas," measures to rationalise the use of smartphones should be dedicated to this age group. The results of a nationwide survey carried out among young people aged 12–19, say, among other things, that 86.6% of pupils regularly use smartphones,[4] a third of teenagers admit to being addicted to social media, 10% of participants are in a relationship with someone they only know on-line, 20% admit to posting untruthful content about themselves on their profile and a quarter of those surveyed feel overwhelmed by the overload of information coming out of the internet. Moreover, it appears that about 14% of the Polish youth suffer from FOMO syndrome (the need to be on-line all the time due to the fear of being left out), half of the respondents feel the need to react immediately to incoming messages and notifications, and 28% feel anxious when they are not up to date with what others are doing on-line.[5]

It turns out that excessive use of mobile phones is the most important problem among all e-addictions. It received the majority of answers in all the groups surveyed, i.e. 83.4% teachers and 65.4% pupils, as well as 55.5% parents.[6] Let us add that it is the most important issue (88.8% of indications) in the lives of pupils among many other problems not only related to e-addiction.[7] The group described is referred to as the *always-on* generation due to the need to be on-line all the time. The reason for this is the lack of alternatives for spending time and the lack of knowledge about the dangers and mechanism of addiction. Pupils also find it difficult to concentrate, which is partly due to overstimulation, ineffective teaching methods, inadequate motivation of pupils, as well as inappropriate relationships with teachers and phonoholism. A worrying feature of the pupils is also their difficulty in establishing and maintaining direct relationships with friends. The easy and quick communication offered by smartphones, in which emotions can be hidden, replaces real contact with peers. Over time, the social skills that are so important at this age can become cumbersome and confronting another person face to face can cause fear. Increased activity in social media demonstrates the strong influence of peer interaction and their on-line activities. One in five teenagers, when comparing themselves with others, rate their lives as not very happy, and 20% of participants admit to publishing untruthful content about themselves to meet the demands of the on-line community.[8] Another urgent issues are

4 *Wzory korzystania ze smartfona*, https://dbamomojzasieg.pl/wp-content/uploads/2021/03/Wzory-korzystania-ze-smartfona.png [accessed: 29/03/2022].

5 M. Dębski, M. Bigaj, *Młodzi Cyfrowi. Nowe technologie. Relacje. Dobrostan.* https://dbamomojzasieg.pl/wp-content/uploads/2019/12/Mlodzi-Cyfrowi.-Nowe-technologie.-Relacje.-Dobrostan_ksiazka.pdf [accessed: 29/03/2022].

6 Najwyższa Izba Kontroli, Delegatura w Kielcach, *Informacja o wynikach kontroli. Przeciwdziałanie e-uzależnieniu dzieci i młodzieży*, Kielce 2016, https://www.nik.gov.pl/plik/id,12563,vp,14960.pdf [accessed: 29/03/2022].

7 M. Dębski, *Wykres nr 37. Ważność problemów w życiu uczniów (%) – Odpowiedzi nauczycieli*, [in:] *Nałogowe korzystanie z telefonów komórkowych. Szczegółowa charakterystyka zjawiska fonoholizmu w Polsce. Raport z badań*, Gdynia 2016, p. 115, https://www.lol1.pl/wp-content/uploads/2017/04/Nalogowe-korzystanie-z-telefonow-komorkowych.-RAPORT-Z-BADAN.pdf [accessed: 29/03/2022].

8 M. Dębski, M. Bigaj, *Młodzi Cyfrowi. Nowe technologie*, p. 11.

provided by the HBSC 2020 Report,[9] which analyses data on the physical health, social relationships and mental well-being of 227,441 pupils aged 11, 13 and 15 from 45 countries in North America and Europe. In Poland, most of the results are worrying. Polish teenagers have the highest rate of negative self-perception, which experts say is a result of less physical exercise. They are also in the top ten for high intensity use of electronic communication tools. Smartphones are contributing to a decline in happiness and satisfaction with life. According to research, there has been an increase in depression and suicide cases among teenagers since 2012. Mobile technology contributes to relationship problems, objectification, sexualisation, impaired adulthood, obesity or the rise of ADHD.[10]

Fig. 4. Negative consequences of the misuse of smartphones, source: https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

On the needs of pupils: self-control as the key to success

A key pupils' need, identified by the designers (as evidenced by the authors' qualitative research and the *Młodzi Cyfrowi (Young Digitals)* report) is the acquisition of self-control skills regarding the use of mobile phones in the school environment. The absence of these skills is a common phenomenon. The problem of the misuse of smartphones is recognised by the pupils themselves, with 25% of those surveyed feeling overwhelmed by the excess of information flowing out of the internet. The need for self-control is also evidenced by the widespread FOMO syndrome, involving around 14% of pupils.[11] Moreover, "84.2% of pupils use smartphones during breaks between lessons", while "33.7% of pupils admit that they very often use their mobile phone in lessons for private purposes".[12] According to dr Łukasz Srokowski, expert of the cyber-safety project 'cyfrowobezpieczni.pl' and founder of the author's schools Navigo, it is more or less up to the age of seven that parents control their children's contact with digital media. Between the ages of 7 and 11 there is a growing problem of losing self-control in the context of using smartphones, and from the age of 13 upwards, a lot of social needs

9 J. Mazur, *Jakie są polskie nastolatki? Raport HBSC 2020*, https://imid.med.pl/pl/aktualnosci/jakie-sa-polskie-nastolatki-raport-hbsc-2020 [accessed: 29/03/2022].
10 K. Lewestam, *Jak naprawić internet? Zombifikacja dzieci. O pladze smartfonów.,* https://magazynpismo.pl/cykle-pisma/jak-naprawicinternet/zombie-fonoholizm-dzieci-smartfon/# [accessed: 29/03/2022].
11 M. Dębski, M. Bigaj, *Młodzi Cyfrowi. Nowe technologie*, p. 13.
12 *Smartfon w szkole*, https://dbamomojzasieg.pl/wp-content/uploads/2021/03/smartfon-w-szkole.png [accessed: 29/03/2022].

are satisfied on-line.[13] According to the NASK report, "as respondents get older, the length of time they spend using the Internet increases, and this relates to all the surveyed locations, i.e. at home, at school, on the way, with friends, in public places". Let us highlight that the highest percentages were recorded in the 'school' and 'on the way from home to school' categories.[14] Smartphones and mobile phones, on the other hand, are the most common devices offering mobile access.[15] As pointed out by dr Srokowski, self-control, i.e. the ability to give up what we impulsively want to do now in favour of what will be better for us in the long term, is a trait that influences success and happiness in life. According to him, the ability to restrain instant gratification is particularly important in the context of digital media.[16] This is because they are the source of many dysfunctions both in the area of the pupils' psycho-physical condition and in the area of social relations.[17]

Unfortunately, contemporary primary school in Poland does not support pupils in practising self-control in this area. The most common solution is to introduce more or less radical regulations specifying the use of mobile devices on the school premises. A clear gap in Polish primary schools is represented by the "lack of action on even very simple, basic issues such as talking to pupils about what they do on the Internet or talking about how to react in case of threats".[18] The results of the 2018 EU Kids Online Polish research report clearly show that there are still too few media education initiatives, at least in the area of formal education. Moreover, the in-depth interviews conducted by the designers with primary school pupils confirmed that radical bans on the use of mobile devices based on external control (monitoring, confiscation of phones by teachers) actually have the opposite effect. These observations are in line with the opinion of dr Łukasz Srokowski, who argues that the more external control increases, the greater the risk that a child's internal control will decrease. Unfortunately, as the above data and conclusions show, Polish school do not dispose of tools or methods to strengthen pupils' self-control in the use of mobile phones. This absence has far-reaching negative consequences in the areas of social relations, efficiency and the psycho-physical condition of schoolchildren. According to experts, the key to ensuring pupils' relative psychological well-being is to draw their attention to the safety of using new technologies[19] and the importance of personal, face-to-face interactions.[20]

13 Ł. Srokowski, *Webinar. Dzieci w wieku 7-11 lat w cyfrowym świecie*, https://www.facebook.com/watch/live/?ref=watch_permalink&v=260943112464375 [accessed: 29/03/2022].
14 NASK, *Raport z badania Nastolatki 3.0*, Warsaw 2017, p. 9, https://docplayer.pl/57655488-Raport-z-badania-nastolatki-3-0-raport-z-badania-nastolatki-3-0.html [accessed: 29 March 2022].
15 J. Pyżalski, *Polskie badanie EU Kids Online. Najważniejsze wyniki i wnioski*, Poznań 2019, p. 20, https://fundacja.orange.pl/files/user_files/EU_Kids_Online_2019_v2.pdf [accessed: 29/03/2022].
16 Ł. Srokowski, *Webinar. Dzieci w wieku 7-11 lat w cyfrowym świecie*.
17 M. Dębski, M. Bigaj, *Młodzi Cyfrowi. Nowe technologie. Relacje. Dobrostan.*, p. 17, https://dbamomojzasieg.pl/wp-content/uploads/2019/12/Mlodzi-Cyfrowi.-Nowe-technologie.-Relacje.-Dobrostan_ksiazka.pdf [accessed: 29/03/2022].
18 J. Pyżalski, *Polskie badanie EU Kids Online*, pp. 50–51.
19 M. Dębski, *Nałogowe korzystanie z telefonów komórkowych. Szczegółowa charakterystyka zjawiska fonoholizmu w Polsce. Raport z badań – skrót*, Gdynia 2017, p. 42, https://dbamomojzasieg.pl/wp-content/uploads/2016/04/Na%C5%82ogowe-korzystanie-z-telefonow-komorkowych.pdf [accessed: 29/03/2022].
20 M. Dębski, *Nałogowe korzystanie z telefonów komórkowych… – skrót*, p. 14.

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Teachers towards smartphones

The problem identified affects also indirectly primary (grades 5–8) and secondary school teachers. Their main task as organisers, managers and guardians of the education and teaching process at school is to prepare the young generation for life and work in the society. This requires an adequate level of teachers' education, their constant concern for intellectual development, but also the support provided by the school establishment in which they work.[21] Given the cross-section of ages of the children they teach (10–19 years old), they have major influence on the pupils. They are involved in the most difficult stage of young adolescence, which can be problematic. It requires teachers to constantly strive to and be able to form relationships with different types of personalities and to face different adversities. The most important problem among pupils noted by teachers is the excessive use of mobile phones (88.8% of responses). "96.4% of teachers admit that it is possible to become addicted to a mobile phone," which indicates a high awareness of the problem, while "one out of four teachers (28.9%) declared knowing more than 10 people who could be described as phonoholics".[22]

> The main consequences of the excessive use of phone indicated by the teachers include problems with concentration (68.7%) and neglecting school duties (64.4%). Teachers also cited among the frequent effects general exhaustion (44%), hyperactivity (43%) and being on the phone all time long (42%). [23]

23.7% of the respondents admitted that they sometimes use their mobile phones for private purposes during classes.[24] Furthermore, "16.1% of teachers admitted they had been the victim of cyber harassment by a pupil at least once in their life".[25] Teachers do not have the conditions and tools to transfer their knowledge on this topic.[26] They have to follow the rules of the restrictive regulations of educational establishments, where the most common solution are to impose controlling attitudes on pupils regarding their use of smartphones.[27]

On the teachers' needs: developing media education as a way to promote self-control

A key need of primary and secondary school teachers identified by the designers is to acquire the competences, conditions and tools to implement media education, especially in the area of building pupils' self-control relating to the use of smartphones. "86.7% of teachers agree that classes on

21 D. Wiktor, *Rola nauczyciela w wychowaniu*, https://www.profesor.pl/publikacja,4122,Artykuly,Rola-nauczyciela-wwychowaniu [accessed: 29/03/2022].
22 M. Dębski, *Nałogowe korzystanie z telefonów komórkowych… – skrót*, p. 39.
23 M. Dębski, *Nałogowe korzystanie z telefonów komórkowych*, p. 119.
24 M. Dębski, *Nałogowe korzystanie z telefonów komórkowych*, p. 116.
25 *Smartfon a nauczyciele*, https://dbamomojzasieg.pl/wp-content/uploads/2021/03/smartfon-a-nauczyciele.png [accessed: 29/03/2022].
26 M. Dębski, *Nałogowe korzystanie z telefonów komórkowych… – skrót*, p. 40.
27 J. Pyżalski, *Polskie badanie EU Kids Online*, pp. 49–51.

phonoholism, as well as Internet and mobile phone addiction should be part of their schools' curricula." They themselves rate their knowledge in this area as "sufficient plus".[28]

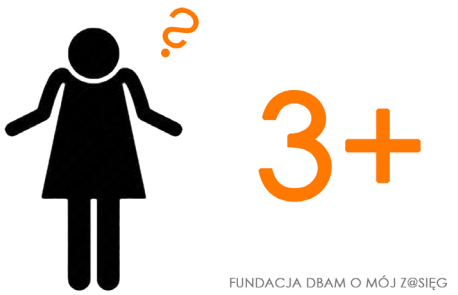

Fig. 5. Teacher rates their knowledge of media education at 3+, source: https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

Top-down regulations on the use of mobile phones in the school environment put the teacher in the role of exerting control over pupils who do not comply with the rules, which is often a source of dissatisfaction on both sides.

Fig. 6. School caretaker, source: https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

There is a lack of knowledge and competence and a lack of space for alternative attitudes based on constructive dialogue with the pupil and the building of their self-control. This is indicated primarily by the opinion of teachers regarding the specific regulations in place: 56% of teachers are in favour of a complete ban on smartphones in schools, 17.5% are strongly opposed, 17.4% answer "rather not" and 9.1% have no clear opinion on this topic.[29] Several important issues such as the understanding of educational and pedagogical goals, teachers' professional digital knowledge and their preparation for the use of technology remain neglected. Unfortunately, in the Polish school education system, the issue of media education, underpinned by professional pedagogical knowledge, is ignored or

28 *Smartfon a nauczyciele*, https://dbamomojzasieg.pl/wp-content/uploads/2021/03/smartfon-a-nauczyciele.png [accessed: 29/03/2022].
29 M. Dębski, *Nałogowe korzystanie z telefonów komórkowych*, p. 116.

marginalised. The sphere of introducing technology into schools is often limited to taking care of the infrastructure and the quality of the equipment. What is ignored is the sphere of the social dimension of the introduction of technology, as well as the attitudes and competences of the participants in this process. There are also relatively few pedagogical solutions that make technology an effective educational tool. Well thought-out combination of traditional didactic solutions with digital ones is a rarity,[30] which makes the quality of Polish education diverge from European standards.

Pupils in the face of contemporary attempts to tackle smartphone abuse

Fig. 7. Forbidden fruit is always the sweetest, source: https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

At present, a key problem for pupils is the lack of self-control regarding the use of mobile phones in the school environment. The short-term impact of the problem contributes to reduced concentration during classes and avoidance of establishing real relationships with other pupils during breaks. Furthermore, the negative impact of the problem affects not only the smartphone users themselves, but also, as a so-called bad example, influences other pupils, causing a 'chain reaction' in the misuse of mobile phones. Lack of self-control also has far-reaching negative consequences both in terms of social competences (such as poorer interpersonal relations among pupils, self-isolation, atrophy of peer and family bonds, inability to spend time in a creative way, neglect of school and family duties, cyberbullying), and in terms of the psycho-physical condition of the pupils themselves (addiction to the use of communication tools, poor learning effectiveness, low self-esteem, the feeling of lack of influence on the surrounding world, or even anxiety typical for withdrawal syndrome, irritability, disruption of the reward system, problems with concentration, lack of sleep, problems with eyesight, changes in the vertebrae), which is confirmed by nationwide surveys conducted among pupils and teachers and the social experiment cited in the article *poz@siecią*[31]. Another concerning fact, highli-

30 J. Pyżalski, *Polskie badanie EU Kids Online*, p. 43.
31 M. Dębski, *Nałogowe korzystanie z telefonów komórkowych… – skrót*, pp. 43-56.

ghted by Adam Almer in his book *Irrresistible: the rise of addictive technology and the business of keeping us hooked*, is that the environment of the digital age is conducive to addiction.[32]

School establishments in Poland are currently trying to deal with this problem by introducing more or less radical rules regulating the conditions for bringing mobile phones and other electronic devices onto school premises and using them. What is characteristic and confirmed by the authors' observations, methods based on external control (monitoring and a total ban on mobile phones) are completely ineffective. This is in line with a psychological assumption that has been commonly known for decades, that repression, restrictions and external sanctions usually have the opposite effect and that the mechanism of the forbidden fruit does not work - when we prohibit children from using smartphones, we only encourage them to do so.[33] Unfortunately, most of the solutions offered today dedicated to limiting children's use of mobile devices are based on external control. In Polish schools, monitoring (cameras in school corridors) and supervision by teachers is a common measure. An interesting example are casings produced by the American company YONDR, made of materials that protect against electrostatic fields and having a safety clip that prevents the phone from being pulled out of the cover without the use of a special unlocking station.[34] However, the product, which is used in schools and at events, is not welcomed by many pupils criticising restrictions on personal freedom, as shown, among other things, by statements from a video summarising the use of YONDR at San Lorenzo High School in California.[35] Deactivation of phones with a physical device is after all based on a top-down order introduced by the school management. The persons authorised to unlock the covers are teachers, not pupils. Similar solutions, i.e. covers blocking the GSM and GPS signals, are available in Poland, but they have never been widely used at schools. Applications such as Google Family Link or Fee Parental Control are also based on a principle similar to YONDR. Decisions about when children use their phones are put in the hands of parents. However, these are not tools dedicated to the school environment, as it is impossible to enforce pupils to install an app that cuts off power or Internet access on their smartphone for school time.

The most effective methods for dealing with the abuse of mobile devices by pupils so far are based on rationalisation and media education. There are school establishments, teaching initiatives and projects that propose systemic solutions which enable making better use of digital tools to support pupils' development, while keeping children safe and teaching them the principles of wise use of the Internet and digital devices. We can cite here for example such projects as *Cyfrowobezpieczni (Digitally*

32 A. Alter, *Irrresistible: the rise of addictive technology and the business of keeping us hooked,* transl. A. Gomola, Kraków 2018, p. 12.
33 Ł. Srokowski, *Webinar. Dzieci w wieku 7-11 lat w cyfrowym świecie*.
34 https://www.overyondr.com/howitworks [accessed: 30/03/2022].
35 https://www.youtube.com/watch?v=rcDbJwZ7G9k [accessed: 30/03/2022].

Safe)[36] or *Edukacja medialna (Media Education)*.[37] However, these initiatives are still a minority. Well thought-out combination of traditional teaching solutions with digital ones is still a relatively rare phenomenon.

It is worth mentioning that on the Polish market, we can find telephone lockers designed for school and office facilities. However, this is not a piece of furniture that deactivates mobile devices, and it was created primarily for anti-theft protection.

Teachers towards contemporary attempts to tackle smartphone abuse

Currently one of the major problems of primary and secondary school teachers is the lack of competences, conditions and tools to implement media education, especially in the area of building pupils' self-control relating to the use of mobile phones. This results in the fact that the teacher is virtually excluded from the digital world visited by the pupils: an important part of the culture and interests of the younger generation. In addition, the top-down restrictions introduced by most educational institutions (with regard to the use of mobile phones by pupils) assign teachers the role of gatekeepers, controlling the use of smartphones by pupils, which has a negative impact on the quality of the relationship between teachers and pupils. As many as 51.7% of teachers set rules regarding the use of mobile phones at school, 27% of them check that pupils have their phones switched off and 25% take mobile phones away from pupils for some time.[38] The negative consequences of teachers' lack of competence in transferring media knowledge, especially in the area of self-control regarding pupils' smartphone use, include poorer teacher job satisfaction, poorer performance and low efficiency, poorer quality of relationships between pupils, as well as an overall impact on the deterioration of the atmosphere in the school environment.

Currently, as the research cited above indicates, a large proportion of teachers are coping with the problem by implementing radical measures to prevent pupils from using smartphones. However, the introduction of a penalty system does not bring good results. Some use prohibition, others – as indicated, among other things, by the qualitative interviews conducted by the authors – try to stick to the culture of constructive dialogue. The latter work together with the children to set rules for phone use at school and stick to these rules themselves. Trying to be wise leaders, they create a culture of values. For example, during a workshop conducted in one of the partner primary schools, a box into which the children put their phones for a period of time during classes was developed together with the pupils. As it turns out, activities carried out in an interesting way, often based on dialogue and pupils' interests, can have a motivating power.

36 https://www.cyfrowobezpieczni.pl/ [accessed: 30/03/2022].
37 https://edukacjamedialna.edu.pl/lekcje/ [accessed: 30/03/2022].
38 J. Pyżalski, *Polskie badanie EU Kids Online*, p. 50.

The issue of media education underpinned by professional pedagogical knowledge is unfortunately still neglected or marginalised in the Polish school education system.[39]

Seeking solutions in the field of design – SMART CONTROL

The authors defined as the heart of the problem the lack of self-control of primary and secondary school pupils regarding the use of smartphones at school. This lack has a negative impact on learning performance and the quality of interpersonal relationships. The problem also indirectly affects teachers who do not have the conditions and tools to transfer their knowledge in this area – as indicated by the studies cited above. As the above discussion has shown, external obligation is a futile tool in the fight against the misuse of smartphones.

And what if we gave control back to the pupils? Faced with the needs of the pupils, the designers created a solution concept based on putting control in the hands of young people. Based on the belief that digital technologies can only be beneficial if they are implemented on the basis of a well-structured pedagogical concepts, the authors decided to reflectively integrate traditional teaching solutions, based on the principles of partnership and teamwork, with physical devices and digital media. The added value is to provide pupils with an environment that would enable training self-control in the use of mobile phones at school, which in the long term will result in a sense of influence on the world around them, better relationships with other pupils, teachers, family, better learning performance and the development of creative leisure skills. In addition, learning self-control, trained in the school environment, can inspire in a positive way to engage in activities in the environment outside school.

The authors assumed the possibility of involving teachers in the use of the solution (used for teaching purposes), giving them space to enhance their own professional satisfaction, build healthy relationships with pupils and increase the quality of their classes and inter-class activities, which could take place with mobile devices completely switched off. The added value is to provide teachers with the conditions and tools for transferring media education knowledge, especially in the area of building pupils' self-control relating to the use of mobile phones. The designers decided to include the integral role of the teacher as a mentor in the process, rather than someone passively transferring knowledge. This will shift the initiative and active role to the pupils, which can have a positive impact on their intrinsic motivation.[40]

The overarching aim of the project is to teach primary and secondary school pupils self-control in the use of mobile phones and to create the conditions that would stimulate intrinsic motivation and cooperation in this area through collective action by the whole class.

39 J. Pyżalski, *Polskie badanie EU Kids Online*, pp. 50–51.
40 B. Tołwińska, *Motywacja dzieci do uczenia się (problemy dzieci, rola dorosłych)*, Białystok 2009, p. 202, 203.

The indirect aim is to offset the negative effects of the misuse of mobile phones, such as reduced efficiency or the deterioration of direct relationships between pupils.

The *SMART CONTROL* solution aims to fill an existing gap in current methods of tackling this issue. The innovation consists of a design solution (working within a specially designed scenario from the field of media education) that stimulates pupils' motivation to put down their smartphones while at school, developed in the spirit of gamification, behavioural design, *mindful design* and *team-based learning* promoted by Larry Michaelsen[41].

The main idea is to create and implement in primary and secondary schools modular smartphone lockers with a mobile device deactivation function and software that counts the deactivation time. The resting time of the smartphones will be converted into a specific number of points, for which the pupils will be rewarded at each stage, until they reach the final goal set together in the follow-up activities and the Design Thinking workshops.

Testing the effectiveness of *SMART CONTROL* will be based on the following activities:

- Use of the software monitoring smartphone activity during the use of lockers.
- Use of a summarising survey or the gamification analysis model developed by the UFAL researchers.[42]

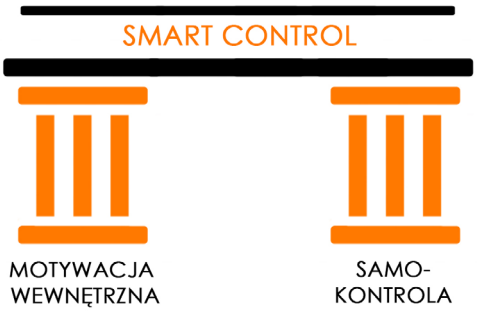

Fig. 8. Pillars of *SMART CONTROL*, authors' design.
(From left: intrinsic motivation, self-control)

41 L. Michaelsen, M. Sweet, *The essential elements of team-based learning*, https://www.researchgate.net/publication/227687640_The_essential_elements_of_team-based_learning [accessed: 30 March 2022].

42 K. Tenório, D. Dermeval, *Gamification Analytics Model for Teachers*, https://www.researchgate.net/publication/347773531_Gamification_Analytics_Model_for_Teachers [accessed: 30 March 2022].

Smartphone lockers

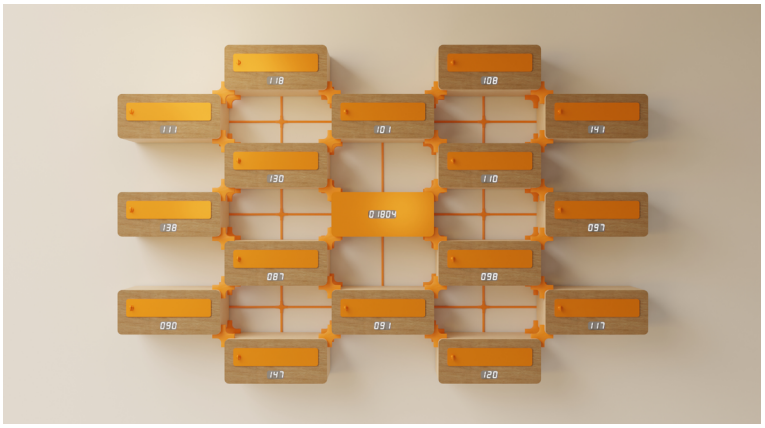

Fig. 9. *SMART CONTROL* – smartphone lockers, authors' design.

These modular mobile phone lockers will be designed for both pupils and teachers. Their basic idea is to combine the function of deactivating mobile devices, software that counts the time phones are kept in individual lockers and the summation of the overall time mobile devices are put away. A suitably designed system of combining individual modules will enable personal lockers to be grouped together according to the number of people in a class. Each locker will block access to external electrical fields, so the smartphone placed inside will be virtually inoperable. Information about the state of standby of the smartphone inside the locker will be manifested by interactive lighting of the appropriate colour, located on the front of the locker. It is assumed that the mechanics of the lockers will be based on an interactive system integrated into their physical form. A single technology module (for one class) will consist of mini-scales, Arduino Mini microcontrollers, a Raspberry Pi microcontroller, as well as an interactive lighting and display counting the resting time of the smartphone(s). Technology that monitors smartphones resting time will overtly report on the project's progress.

The *SMART CONTROL* design solution, drawing inspiration from the self-determination theory of Richard M. Ryan and Edward L. Deci, aims to enhance self-control through intrinsic motivation based on autonomy, competence and bonds.[43] Its main assumption is to leave the decision to put the phone down to the pupils and to build intrinsic motivation through gamification strategies[44] and *team-based learning*.

43 R.M. Ryan, E.L. Deci, *Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being*, https://selfdeterminationtheory.org/SDT/documents/2000_RyanDeci_SDT.pdf [accessed: 30 March 2022].

44 M. Sailer, J.U. Hense, S.K. Mayr, H. Mandl, *How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction* https://www.sciencedirect.com/science/article/pii/S074756321630855X [accessed: 30 March 2022].

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Fig. 10. *SMART CONTROL* - retail, smartphone lockers, authors' design.

Innovative features of *SMART CONTROL*

Research conducted by Walter Mischel, author of the book *The Marshmallow Test: Mastering Self--Control* , prove that self-control is one of the key tools to help cope with addiction problems, which has an indirect effect on better social functioning and improved self-esteem.[45] Its absence in terms of smartphone use can cause irreversible consequences, such as poorer interpersonal relationships, cyberbullying, FOMO, inability to spend time in a creative way or even addiction, and – by extension – anxiety typical for the withdrawal syndrome.

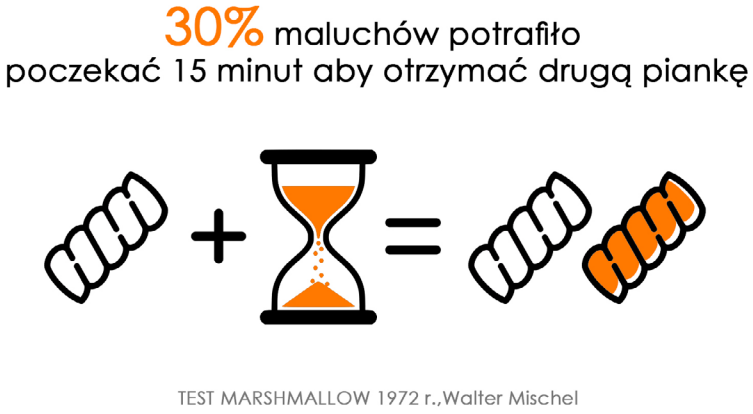

Fig. 11. Marshmallow Test, source: https://www.flaticon.com,
authors: https://www.flaticon.com/authors/freepik, own adaptation.

As pointed out by dr Łukasz Srokowski, one of the possible ways for teaching children self-control is to give them the opportunity to take control over their use of the digital world. This is also confirmed

45 W. Mischel, *The Marshmallow Test: Mastering Self-Control (Test Marshmallow. O pożytkach płynących z samokontroli)*, Sopot 2015.

by Mikołaj Marcela, who argues that education can be directed in such a way that children want to acquire knowledge themselves and are prepared for the challenges of the future.[46]

SMART CONTROL proposes alternative problem-solving methods, focusing on strengthening self-control by stimulating self-determination, which is in line with the aforementioned model of intrinsic motivation created by Ryan and Deci, based on autonomy, purpose and mastery.

The methods used in the innovation are based on the ideas of gamification, behavioural design, teamwork and the premise of *Mindful Design*.

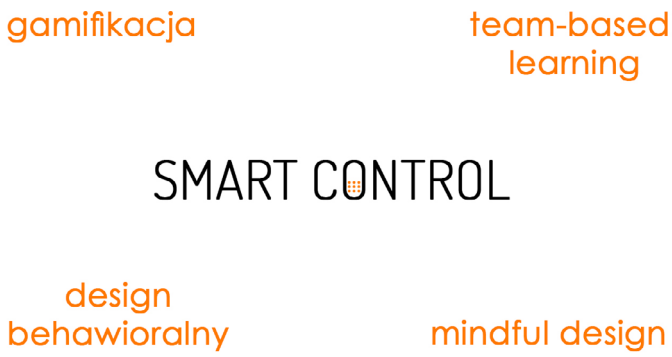

Fig. 12. *SMART CONTROL* = gamification + *team-based learning* + behavioural design + *mindful design*, authors' design.

Fig. 13. Gamification, sources: https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

Gamification

Authors of the innovative *SMART CONTROL* lockers assume, following Adam Alter, that the principles encouraging children to play on a smartphone can be used also as motivation for learning.[47]

46 M. Marcela, *Jak nie zwariować ze swoim dzieckiem?*, https://www.ojcowskastronamocy.pl/jak-nie-zwariowac-ze-swoim-dzieckiem-mikolaj-marcela-osm-podcast-056/ [accessed: 30/03/2022].

47 A. Alter, *Irresistible: the rise of addictive technology and the business of keeping us hooked*, chapter 12: *Gamification*.

They strive to provide pupils with opportunities to achieve small successes, which show that working on oneself is worth the effort.

While the gamification model is mainly used in the field of marketing, it is currently rarely used in education, as education using game methodology is a relatively new domain.[48] Its effectiveness in this field is described, among other things, by Adam Alter in the already mentioned book *Irrresistible: the rise of addictive technology and the business of keeping us hooked.* [49]. According to the author, on the global market there are relatively few physical devices that would support self-control, while solutions treating people for smartphone addiction and behavioural addictions are still in the early stage. Some of them, for example the Pavlok armband,[50] act through negative feedback, others, such as Matheus MOTI device[51], act through gratification. However, these solutions are too recent to speak about their effectiveness. Some hope, as evidenced by the good results of tests carried out in the use of such products, is offered by social products realised in the spirit of gamification. One of examples of such products can be found in Stockholm, where a glass container turned into a slot machine has increased the number of people throwing bottles into the correct container from 2 to 100.[52] This fact suggests that the application of this type of solution in education, underpinned by ideas of behavioural design, could be a breakthrough innovation.

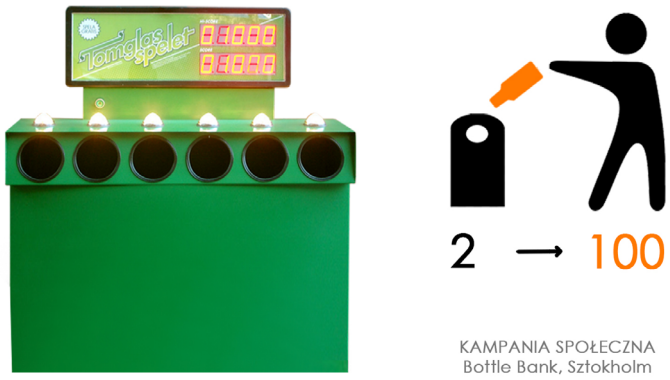

Fig. 14. Bottle Bank social campaign, source: https://m.facebook.com/thefuntheory/, https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

48 A. Stott, C. Neustaedter, *Analysis of Gamification in Education*, http://clab.iat.sfu.ca/pubs/Stott-Gamification.pdf [accessed: 30/03/2022].
49 A. Alter, *Irrresistible: the rise of addictive technology and the business of keeping us hooked.*
50 https://pavlok.com/ [accessed: 30/03/2022].
51 https://www.kaylamatheus.com/moti-1 [accessed: 30/03/2022].
52 https://vimeo.com/45220023?embedded=true&source=video_title&owner=12097738 [accessed: 30/03/2022].

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Behavioural design

It is worth to highlight the fact that pupils are rewarded for the very gesture of putting down the smartphone and that good habits are thus formed by consciously moving the problematic stimulus out of sight and body range of the recipient, which is in line with the behavioural design guidelines described by the aforementioned Adam Alter. It is also important to replace behaviours that negatively affect the mental and physical state with other healthy habits. This is in line with the findings of Xianchi Dai and Ayelet Fishbach of the University of Chicago on refraining from using Facebook.[53] In the group of pupils who were allowed to use alternative social media, significantly less tendency to become addicted was noted than in the group that was not given such a permission.

Team work

What counts in the proposed innovation solution is the collaboration and a common goal. The teacher, as an exemplary, equal participant in the project, plays the role of mentor and good guide. *Team-based learning* is an effective method of teaching how to work within a group.[54] New research suggests that children have more self-control when they work together as a team than when they work alone. This is demonstrated, for example, by Walter Mischel's famous foam experiment carried out at the Stanford University in 1972. The experiment was designed to measure how well children are able to delay immediate gratification in order to receive greater rewards in the future - a skill that, if possessed, increases the certainty of success in later life.[55]

Mindful Design

Finally, an important element of the *SMART CONTROL* project is to act based on the principles of attentive design.

Mindful Design can be defined as a human-centred approach to product design and development, respecting the user's privacy, time and attention, helping to improve the human experience. In other words, a design or product should first and foremost be conscious, serve the user, respect the user and provide the them with a meaningful experience.[56] The application of this approach in the designed product aims to offer the recipients and users improvements in cognitive performance, self-regulation and the subjective well-being.[57] This is because *Mindful Design*, by modifying the expected functions

53 A. Alter, *Irrresistible: the rise of addictive technology and the business of keeping us hooked*.
54 http://www.teambasedlearning.org/ [accessed: 30/03/2022].
55 J. Suttie, *Kids Do Better on the Marshmallow Test When They Cooperate,* https://greatergood.berkeley.edu/article/item/kids_do_better_on_the_marshmallow_test_when_they_cooperate [accessed: 30/03/2022].
56 https://blog.prototypr.io/mindful-design-part-1-b0f6282c455a [accessed: 30/03/2022].
57 M. Bosse, C. Woelfel, J. Krzywinski, *Mindful Design: Applying The Mindful Design Approach at Industrial Design Lectures*, https://www.researchgate.net/publication/331529591_mindful_design_applying_the_mindful_design_approach_at_industrial_design_lectures [accessed: 30 March 2022].

of a product's use (phone lockers), can be associated with behavioural change and it broadens the understanding of cognitive social awareness.

The innovative aspect of the proposed solution dedicated to implementation in the school environment is the hybrid combination of the real and digital worlds, as well as the reversal of the standard relationship between them (in *SMART CONTROL* it is the real world that absorbs digital devices, not the other way around).

Fig. 15. Hybrid combination, sources: https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

SMART CONTROL has the potential to become a pioneering solution on the Polish and international market, promoting new trends in the approach to regulating the time pupils use their smartphones. Existing solutions such as, for example, mobile apps or the YONDR cover, rely on external control and, in addition, they 'keep' the problematic smartphone – which thus becomes the forbidden fruit – in close contact with the recipient.

SMART CONTROL meets also the conditions of accessibility:

- the proposed solution can be equally dedicated to representatives of different age groups;
- *SMART CONTROL* allows for flexible adaptation to different situational contexts, including those not related to school, such as home or office spaces.

The flexible form and the aesthetic concept of the lockers have been designed with clear message and minimalist design on mind, and above all with the aim of intuitive functionality. Designed in a modular way, the smartphone locker system allows both the independent operation of a single locker and the combination of any number of lockers to suit any number of users. This enables the solution to be implemented in a variety of environments, including the stand-alone use at home. Moreover, the educational scenario, on which the idea of *SMART CONTROL* is based, can be based on a flexible narrative consisting of objectives adapted to the nature of the educational establishment and the recipients.

The design concept proposed for public primary and secondary schools involves adapting the functionality of the smartphone lockers to people with disabilities. The designers ensured that there were no physical barriers preventing a disabled person from interacting in a satisfactory manner with this solution, for example, by adjusting the height of the wall-mounted cabinets to suit a wheelchair user. This is made possible by a suitably designed system combining the individual modules to personalise the layout of the lockers on the school corridor wall. In addition, care was taken to provide a synthetic interaction scenario oriented primarily towards problem solving and user comfort: an easy-to-use system for opening the locker and closing it, as well as putting in and taking out the smartphone.

The authors responsibly selected solutions from the area of new interactive technologies to address the most important issues of the defined problem in a universal manner (adapted to a broad target group). What is important here is that they can be flexibly adapted to the needs of visually impaired people by using displays that are appropriate in terms of size and legibility, as well as legible interactive lighting with appropriately accentuated colour.

Work on the innovation included observational and analytical research, research with the use of the *Design Thinking* strategy, as well as interviews with people with disabilities and experts experienced in working with such people in order to develop a suitable solution, taking into account how the user interacts with the piece of furniture with the assumption that the main idea is to make the recipient acquire a habit of putting down the mobile device. The overarching goal is to address or eliminate the problem of lack of self-control not only among people who are completely able-bodied, but also among those who face multiple barriers on a daily basis due to their physical limitations.

Educational scenario

The solution is intended to serve as a tool for a properly prepared educational scenario, developed together with teachers, pupils and parents. Motivation will be inspired by the goals based on pupils' interests and small gratifications leading to a final reward, which is in line with the idea of gamification. Gamification in education is a method of motivating pupils to engage in the learning process by covering certain teaching activities with a system that mimics the process of a game.[58]

The above-mentioned method meets the following conditions:

- clear, well-defined assessment rules and feedback provided to the pupil;
- the learner needs to know the objectives from the start – i.e. what is to be learnt and in what time;

58 J. Lee, J. Hammer, *Gamification in Education: What, How, Why Bother?*, https://www.researchgate.net/publication/258697764_Gamification_in_Education_What_How_Why_Bother [accessed: 30/03/2022].

- putting the pupil in such a situation that they feel the need to take action independently and to acquire the skills of team working.

The gaming element of the project, implemented using the interactive piece of furniture, will serve to motivate pupils and teachers to put down their mobile phones during school time. The intermediate goal will be to acquire as many points as possible, the number of which will increase with the amount of time the phone is left unused.

Fig. 16. *SMART CONTROL* – lockers in use, authors' design with the use of pictograms, source: https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

The point score for the different situations of putting down the smartphones and the gratification achieved when successive time thresholds are reached, will be democratically determined during the Design Thinking workshop organised in the initial phase of the project with the participation of the teachers involved and (possibly) the parents. The award can be shared by the whole group or attributed to individual participants (depending on the scenario that emerges from the democratic discussion during the initial Design Thinking workshop). It can be linked to the distinctive profile of the organisation in question and to the development of pupils' interests alternative to the digital world, or it can manifest itself in the implementation of a charitable objective jointly agreed with pupils, teachers and possibly with parents.

The educational scenario consists of:

- **Kick-off workshop** introducing the problem of lack of self-control in the use of mobile phones by pupils and teachers in the school environment, based on the *Design Thinking* methodology, complemented by a questionnaire oriented to diagnose the problem before starting the project. This will be a kind of training explaining the objectives and rules for participating in the project, serving, among other things, to set an overarching goal and a point value for the different stages of putting down the smartphones.

- **Package of 4 or 5 lessons** organised on a regular basis throughout the duration of the educational project to reinforce motivation and awareness of the identified problem, and regular discussions on the progression of participation (pupils' feelings and impressions after having experienced successive phases of telephone abstinence in the school environment):
    - Lesson no 1: The problem of lack of self-control in the use of mobile phones.
    - Lesson no 2: Dangers related to the misuse of smartphones.
    - Lesson no 3: Phonoholism and its symptoms. How do we become addicted?
    - Lesson no 4: Rationalising the use of mobile phones.
    - Lesson no 5: Alternative ways of spending time.
- **Workshop to summarise** all phases of the project, during which the overall time spent during the project with the mobile phones put away will be calculated and awards/prizes appropriate to the number of points scored will be attributed. In addition, a discussion will be held on the experiences of all participants of the innovation and a follow-up survey will be conducted to measure the effectiveness of the innovation in strengthening self-control in the context of pupils using smartphones in the school environment. Measuring the effects of the project will be inspired by the action of the Dbam o Mój Z@sięg Foundation in the *poz@ siecią* experiment, i.e. interviews and surveys conducted with recipients before, during and after the project. Where possible, an analysis using the gamification model developed by the UFAL researchers will also be carried out.

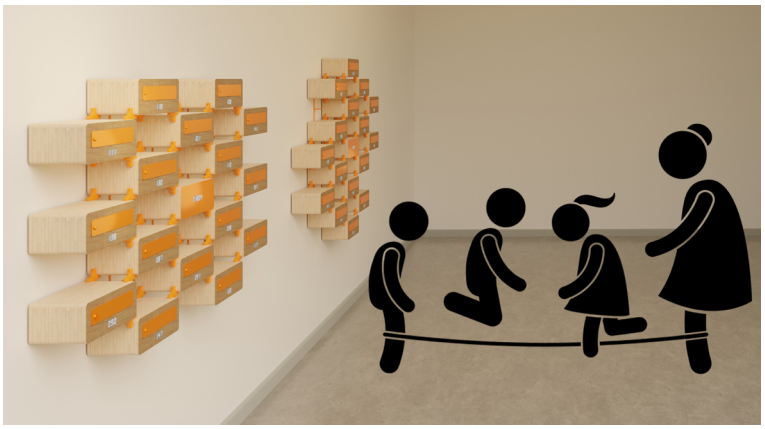

Fig. 17: *SMART CONTROL* in a school context, authors' design with the use of pictograms: source: https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

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Fig. 18. Positive effects of implementing *SMART CONTROL*, source: https://www.flaticon.com, authors: https://www.flaticon.com/authors/freepik, own adaptation.

Conclusions

In summary, given the fact that the development of knowledge in the topic of education is currently shaping new trends focusing on partnerships between pupils and teachers and constructive problem solving based on equivalent dialogue, *SMART CONTROL* seems to be an innovative and promising solution. Existing solutions of copying with the problem, such as, for example, mobile apps or the YONDR cover, rely on external control and, in addition, they 'keep' the problematic smartphone – which thus becomes the forbidden fruit – in close contact with the recipient.

The power of the *SMART CONTROL* message is influenced by the innovative features of the solution, contributing to reinforcing the habit of putting down the smartphone while at school, building awareness, strengthening relationships and enhancing knowledge acquisition:

- Hybridity integrates the physical space of the workstation with the digital space, creating a healthy balance between the entertainment offered by mobile devices and the learning or creative activities.
- New functionality of school furniture includes space to deactivate the mobile device while in school, combined with gamification elements
- A new perspective on smart technologies, which are customarily seen as the source of many contemporary problems, but in this case appear as humanised tools used to reach the recipient. The consciously designed, attractive interaction scenario, the use of relevant sensors and audio-visual effects enable building the viewer's bond with the piece of furniture, nurturing their attentiveness, reinforcing awareness of the issue and rationalising the use of smartphones.

- The partnership approach to the pupil and the stimulation of teamwork increases the effectiveness of the innovation.
- Interactivity enhances the quality of the individual experience and develops good habits among users.
- The ability to verify the results of the applied innovation through the use of a mobile app ensures reliable measurement of the effects of *SMART CONTROL*.
- Compatibility with contemporary design trends of *Mindful Design* and behavioural design promotes the uptake of the solution and increases the effectiveness of combating the lack of self-control in the use of smartphones.

The designers assume that with *SMART CONTROL*, pupils will have the opportunity to practice self-control, which will inspire them to keep this type of attitude in home environment as well. Parents will be able to participate in the educational project implemented as part of the innovation, supporting their children's informed decisions, strengthening partnership attitudes towards the problem of the misuse of smartphones and enhancing constructive cooperation between parents, child and teacher. They may use themselves similar methods in their approach to their own and their child's use of mobile phones in the home environment.

Positive effects of the massive use of *SMART CONTROL* will also be experienced by the principals of the schools that will use this type of innovation. The proposed innovation will increase the attractiveness and efficiency of educational establishments and, in the long term, may even raise their ranking. It will bring an increased sense of community and democratic dialogue between school, pupil and parent.

In addition, the spread of innovations will result in the building of new trends in approaches to the problem described, which may also find fertile ground in non-school environments: for example, in office spaces, co-working spaces and even in private households.

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