# IMPLEMENTING EU INTERACTIVE TEACHING OF ELECTROMAGNETISM AT AL-FARABI KAZAKH NATIONAL UNIVERSITY

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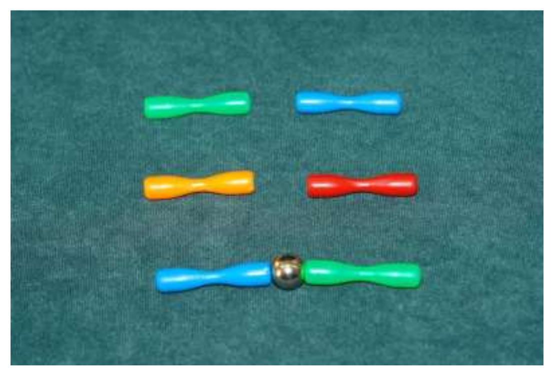
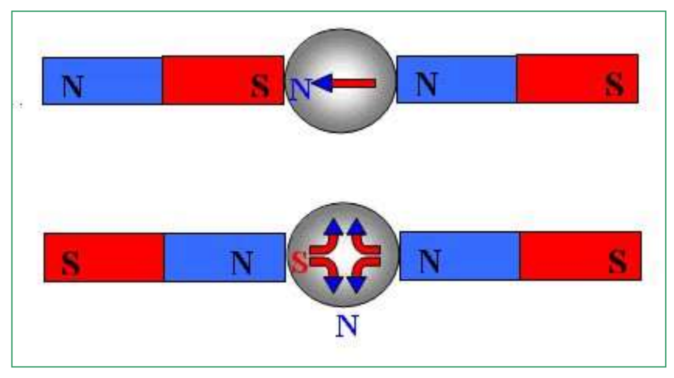
The importance to the affective domain in learning is underscored in many research pursuits at the expense of the cognitive development of students studying science, in particular, physics. The thesis has proposed a structure, the pedagogical technological integrated medium founded on the electronic model that builds on the existing premises of pedagogy, content, and technology to make space for the affective domain where these three premises intersect with each other. In this present work there was shown the implementing EU interactive teaching of electromagnetism contributed to increase the quality of students' educational level". This is because in any (not only constructivistic) discovery, the first is always a real-world observation.

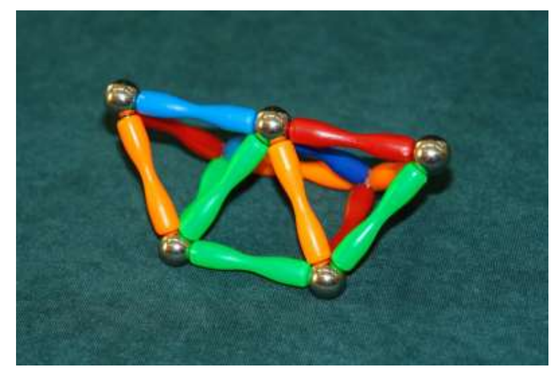


According to the multimedia learning theories and the active processing the assumption learning videos should be more interactive to foster an active processing of the presented information. Students should perceive such interactive videos as more helpful for learning the course "Electricity and Magnetism". The application of interactive teaching methods leads to increase the quality of students' educational level.



We enriched the traditional, text-book teaching, with elements of on-line material, like experiments with electrostatics [2], electromagnetic induction [3] and other videos. As hand-on experiments we proposed both simple objects from Physics "Physics and Toys" collection [4] as well as discovery paths developed within EU educational projects [3, 5]. The advantage of these simple experiments is that they can be constructed directly by students, with the use of every-day objects, like anti-theft labels mounted in clothes sold in supermarkets, magnetic fridge stickers, pieces of wires and neodymium magnets, and so on, see details in [6]. Additional lessons are also conducted using the information technology that allow, in the case of conceptual and numerical exercises, the interactive, step-by-step approach, see ref. [7]. The advantage of this tool (available in Czech, English and Polish) is that students can independently choose proper level and subjects of interest, no particular registration is needed and navigation tools are simple.



**Тұрақты магниттер**
**Магниттік құрылым таяқшалары мен шарлар (көптеген тапсырмалар мен эксперименттер)**

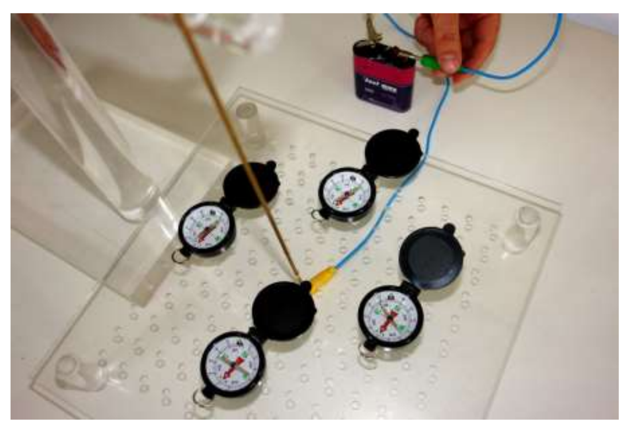
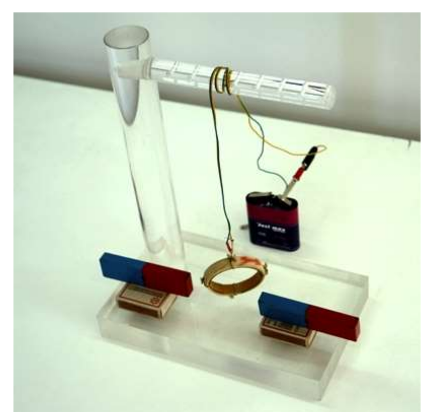
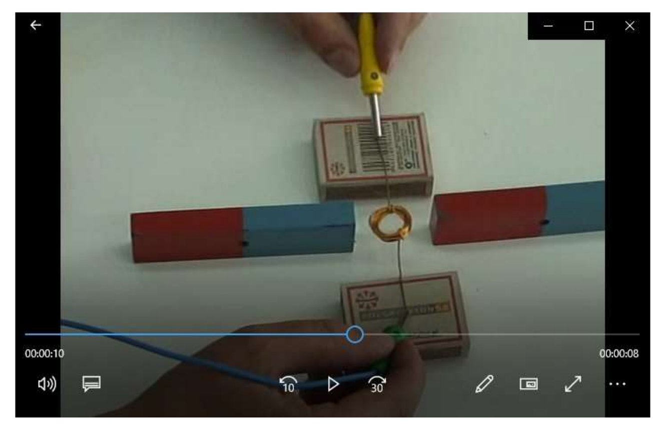
Магниттік таяқшалар – магнитте әрдайым екі полюстің болатындығын көрсетеді, егер ұштарында бірдей полюсті болса бір-бірін тебеді, бірақ олардың ортасында тот баспайтын болаттан жасалған шар болатын болса, онда олар бір-бірін тартады, бұл әсер шарда магниттік домендердің қайта реттелуіне байланысты болады.
Әртүрлі полюс ортасына қойылған «қалыпты» магниттелген темір шар (жоғарғы фигура) осьі ішкі магнит бағытына бағытталған екі полюсті (N-S) магнитке айналады.
Бірдей екі полюс ортасындағы шар (төменгі фигура) өзінің магнит полюсін екі магнит тартылатындай етіп орналастырады. Магниттің перпендикуляр осьі бойынша аумақта «жетіспейтін» полюсті табамыз. Сіз бұл түрлі түсті таяқшалардан тамаша құрылымдар жасай аласыз, бірақ кем дегенде екі магнит ортасына металл шар орналастыру қажет. Егер олай жасамасаңыз, барлығы құлап қалады.
Енді ойлаңыз: магнит не бір-бірін тартады, не тебеді. Егер таяқтың бір шеті басқа таяқшаны тартса, онда бірінші таяқшаның екінші шеті екінші таяқшаны кері итеру керек. Бұл жағдай - біз егер металл шарды полюстер арасына қоймаған кездегі орын алатын жағдай болып табылады.

**Permanent magnets**
**Magnetic construction sticks and balls (many small tasks, experiments)**

Magnetic Sticks - demonstrate that magnets have always two poles - sticks placed by the same poles repel each other, but when stainless steel ball is put between, they attract each other, the effect being caused by magnetic domain re-ordering in balls.

The iron ball inserted between poles of different signs (the upper figure) et magnetised in a "normal" way, becoming a two-pole magnet (N-S), with the axis oriented in the direction of external magnets.
The ball between two poles of the same sign "accommodates" (the lower figure) its magnetic poles in a way to be attracted by both external magnets. We find the "missing" poles on a plane perpendicular to the axis of magnets.

You can create amazing constructions out of those colourful sticks. But at least every two magnets you have to place a metal ball between them. If you don't, the whole thing will fall apart.
Now think carefully: magnet either repel each other or attract each other. If one end of the stick attracts another stick, the other end of the first stick should repel the second stick. And it would be so if we didn't place the metal ball between the poles.

**Лоренц күші**
**Магнит ортасында катушканы қозғалту**

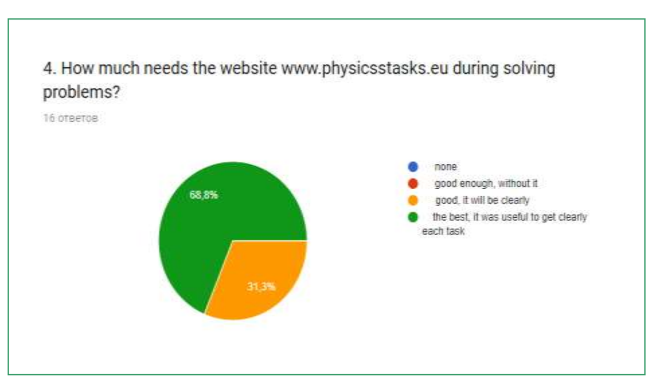
Екі магниттің ортасында катушка орналасқан. Ток катушканың екі шеті бойымен қарама-қарсы бағытта өтуде. Флэминнің сол қол ережесіне сәйкес бір жағы көтеріліп, екінші жағы төмендейді. Басқаша айтқанда, катушкада бұрылу эффектісі байқалады. Катушканың орам саны көп болған сайын, бұрылу эффектісі соншалықты көбірек болады. Көптеген электрқозғалтқыштарда осындай бұрылу принципі қолданылады.
http://dydaktyka.fizyka.umk.pl/MOSEM/html-kz/7.3.html

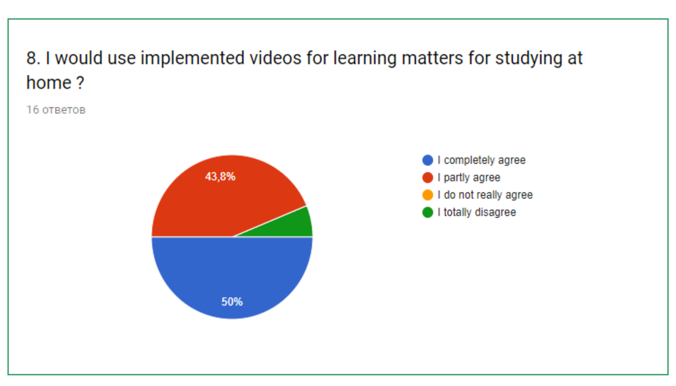
**Lorentz force**
**Turning coil between magnets**

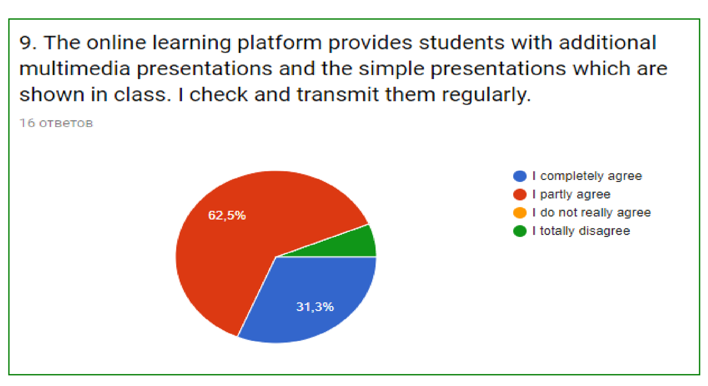
The coil lies between the poles of two magnets. As compared to magnetic field lines, the current flows in opposite directions along the two sides of the coil.
According to Fleming's left-hand rule, one side is pushed up and the other side is pushed down. In other words, there is a turning effect on the coil. With more turns of the coil, the turning effect is increased. Many electric motors use this turning effect principle.
http://dydaktyka.fizyka.umk.pl/MOSEM/html/7.3.html




The knowledge has been measured prior to the intervention and two times afterward. Response to the different contents (E-M from UMK, Physics.Stacks from UK Prague was checked independently.
In spite of the novelty of this blended approach (and also the very preliminary experience of the teachers) we observed a substantial rise of the emotive involvement of students.

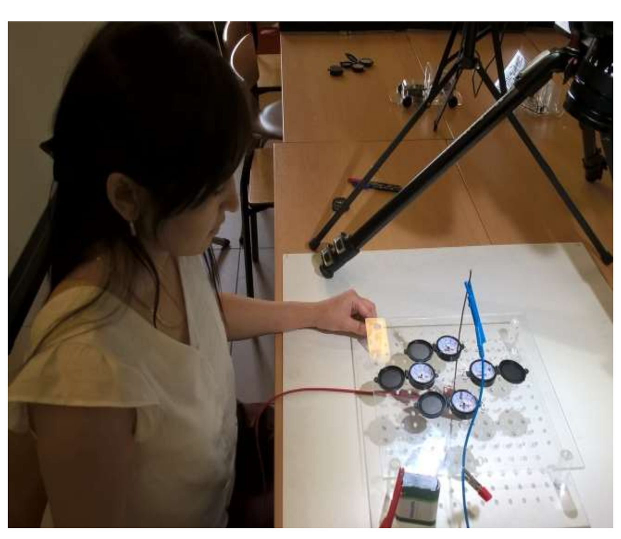


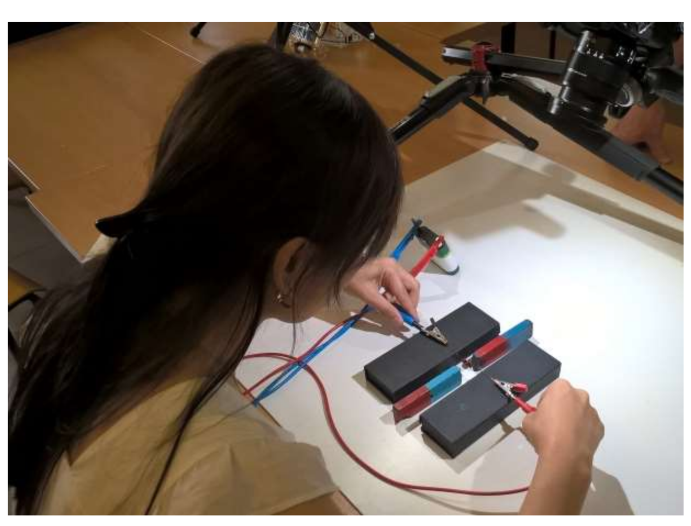





## Conclusions

Concluding, the application of interactive teaching methods and simple experiments leads to a substantial increase of the quality of students' educational level. The choice of electromagnetism as a starting branch proved to be very fruitful, as various educational resources developed within EU projects are available online.



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