VIRTUAL LABORATORIYALAR – MUHANDISLIK TA’LIMIDA AMALIY TAYYORGARLIKNI TAKOMILLASHTIRISH VOSITASI SIFATIDA

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kafedrasi dotsenti.

Annotatsiya. Tezisda virtual laboratoriyalar yagona vosita emas, balki real obyektdan to‘liq virtual muhitgacha bo‘lgan spektrdagi turli texnologiyalar majmui sifatida ko‘rib chiqilgan. Laboratoriya turlari olti mezon bo‘yicha qiyoslangan va o‘quv maqsadiga qarab laboratoriya turini tanlash algoritmi taklif etilgan.

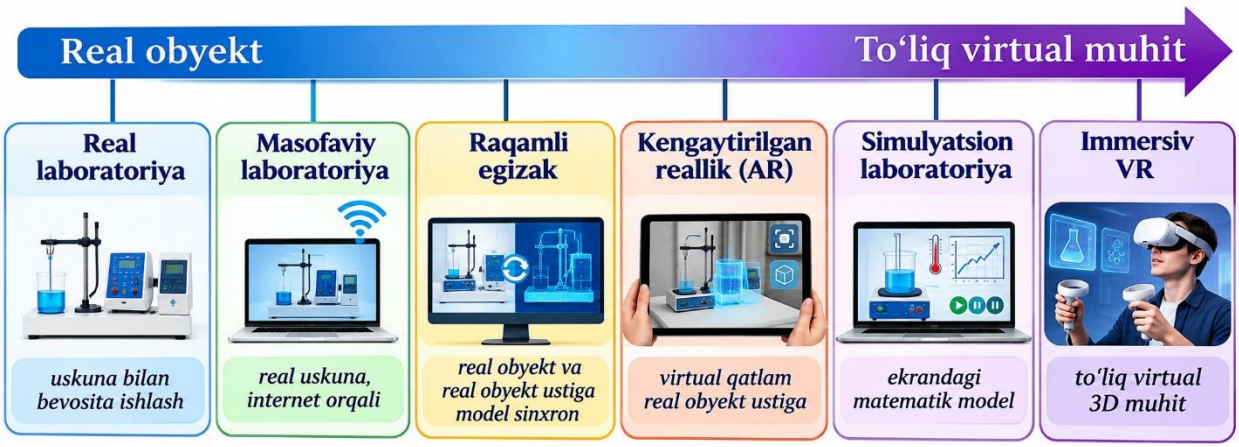
Kalit so‘zlar: virtual laboratoriya, masofaviy laboratoriya, raqamli egizak, kengaytirilgan reallik, immersiv virtual reallik, amaliy tayyorgarlik.

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O‘quv amaliyotida “virtual laboratoriya” deganda ko‘pincha bir-biridan tubdan farq qiladigan vositalar tushuniladi: ekrandagi oddiy simulyatsiya, internet orqali boshqariladigan real stend, virtual reallik ko‘zoynagidagi 3D muhit yoki real qurilma bilan sinxron ishlaydigan raqamli model. Bu vositalarning imkoniyatlari ham, cheklovlari ham turlicha. Shuning uchun “virtual laboratoriya amaliy tayyorgarlikni yaxshilaydimi?” degan savolga umumiy javob berib bo‘lmaydi: javob aynan qaysi turdagi laboratoriya va qaysi o‘quv maqsadi uchun ishlatilayotganiga bog‘liq. Mahalliy tadqiqotlarda ham bu farqlar qayd etilgan. G. Ixtiyarova va hammualliflar virtual reallikka asoslangan o‘quv resurslarini maxsus jihozli to‘liq virtuallik, stereoskopik 3D va oddiy monitor darajalariga ajratgan [1]. D.Sh.Toxirova va hammualliflar esa simulyatsion dasturlar va interaktiv platformalarni farqlagan [3].

P.Milgram va F.Kishino real va virtual muhitlar o‘rtasida uzluksiz “reallik – virtuallik kontinuumi”ni taklif etgan [8]. Bu g‘oyani muhandislik ta’limidagi laboratoriyalarga tatbiq etib, ularni real obyekt ulushi kamayib borishi tartibida joylashtirish mumkin (1-rasm).

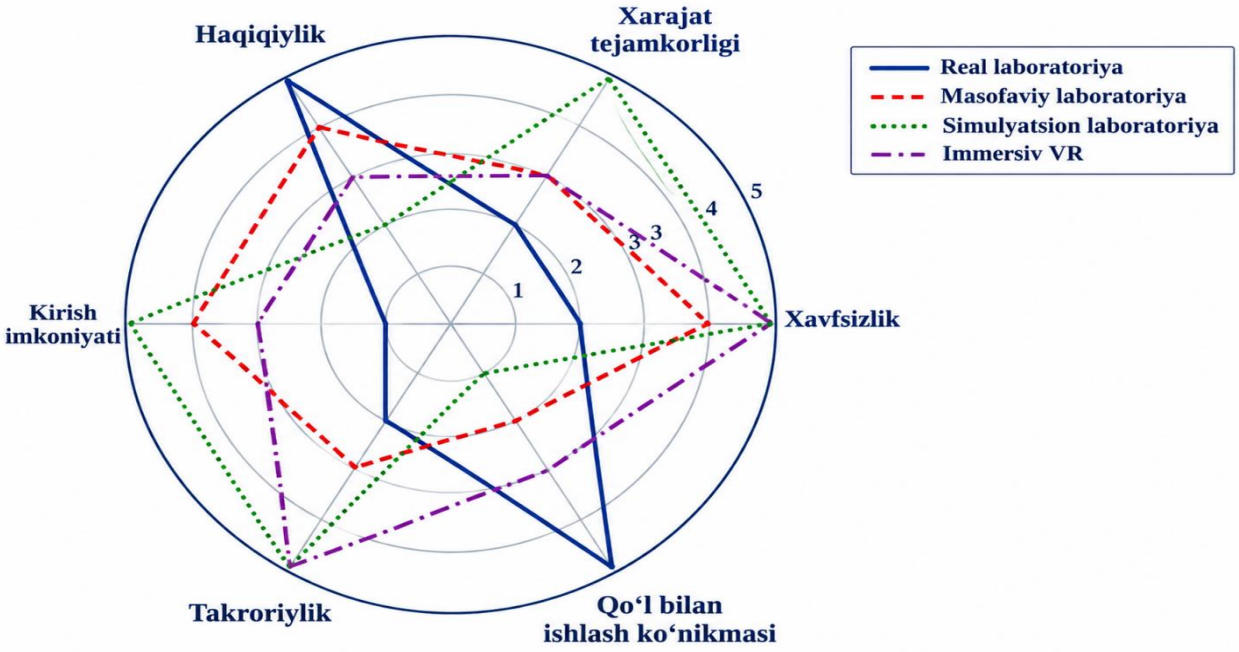
Masofaviy laboratoriyada talaba real uskunani internet orqali boshqaradi. L.Gomes va S.Bogosyan bu yo‘nalishning sanoat elektronikasi ta’limidagi rivojini tahlil qilgan [7]. *Raqamli egizak* real obyektning u bilan ma’lumot almashib turadigan virtual nusxasi bo‘lib, M.Grivs va J.Vikers uni murakkab tizimlarning kutilmagan xatti-harakatini oldindan aniqlash vositasi sifatida ta’riflagan [6]. *Kengaytirilgan reallik* real uskuna ustiga virtual axborot qatlamini qo‘yadi, *simulyatsion laboratoriya* jarayonning matematik modeliga, *immersiv virtual reallik* esa to‘liq uch o‘lchovli muhitga asoslanadi. J. Radianti va hammualliflar oliy ta’limdagi immersiv VR ilovalarini sharhlab, ular asosan protsedurali va amaliy bilimlarni o‘rgatishda qo‘llanilishini ko‘rsatgan [9].



1-rasm. Laboratoriya turlarining real obyektdan to‘liq virtual muhitgacha bo‘lgan spektri

Z.Nedich va hammualliflar real, virtual va masofaviy laboratoriyalarni qiyoslab, ularning har biri o‘ziga xos afzallik va kamchilikka ega ekanini ko‘rsatgan [10]. J.Korter va hammualliflar esa masofaviy va simulyatsion laboratoriyalardagi o‘quv natijalari ko‘p hollarda real laboratoriyanikidan qolishmasligini, ammo talabalar ularni turlicha idrok etishini aniqlagan [5]. T.

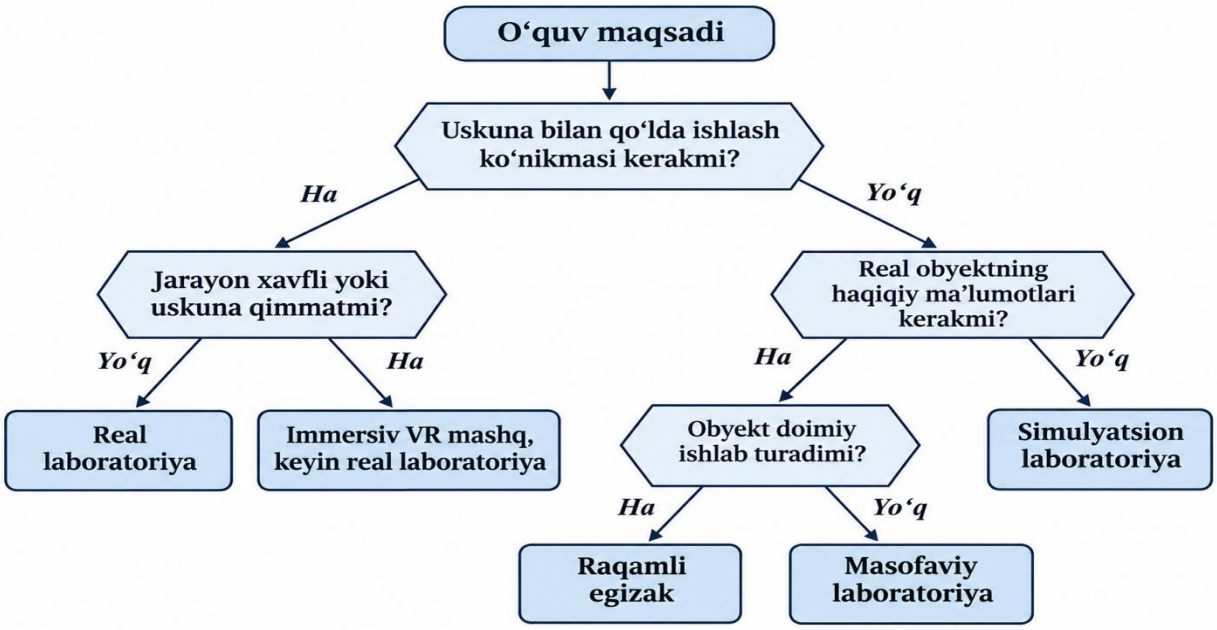
Linch va I.Gergulesku virtual laboratoriyalarni STEM fanlarini o‘qitishdagi yangi texnologiya sifatida sharhlagan [11]. Ushbu manbalar tahlili asosida to‘rt asosiy laboratoriya turi olti mezon bo‘yicha besh ballik shkalada qiyoslandi (2-rasm). Baholar muallifning adabiyotlar tahliliga asoslangan sifatiy bahosi hisoblanadi.



2-rasm. Laboratoriya turlarining olti mezon bo‘yicha qiyosiy tavsifi

Diagrammadan ko‘rinib turibdiki, hech bir laboratoriya turi barcha mezonlar bo‘yicha ustun emas. Real laboratoriya haqiqiylik va qo‘l bilan ishlash ko‘nikmasi bo‘yicha tengsiz, lekin xavfsizlik, xarajat va kirish imkoniyati bo‘yicha eng zaif. Simulyatsion laboratoriya esa aksincha. X.Sh.Aslanov ham virtual laboratoriyalar real tajribani to‘liq almashtira olmasligini, amaliy ko‘nikma va jamoaviy ishlashni real laboratoriya shakllantirishini ta’kidlagan [2]. Sh.N.G‘aniyeva esa virtual reallikning imkoniyatlari bilan birga ko‘z charchashi, bosh og‘rig‘i va psixologik noqulaylik kabi xatarlarini ko‘rsatib, foydalanish vaqtini me’yorlash zarurligini qayd etgan [4]. Bu esa VR baholaridagi cheklovlarni tushuntiradi.

Laboratoriya turlarining afzalliklari bir-birini to‘ldirgani uchun amaliy tayyorgarlikni takomillashtirishning asosiy sharti – har bir mashg‘ulot uchun o‘quv maqsadiga mos turni tanlash. Buning uchun to‘rt savoldan iborat tanlash algoritmi taklif etiladi (3-rasm).



3-rasm. O‘quv maqsadiga ko‘ra laboratoriya turini tanlash algoritmi

Masalan, yuqori kuchlanishli taqsimlash qurilmasida operativ qayta ulashlarni o‘rganishda qo‘l bilan ishlash ko‘nikmasi zarur, ammo jarayon xavfli. Shuning uchun avval immersiv VR mashq o‘tkaziladi, keyin real qurilmada ishlanadi. Transformatorning turli yuklamalardagi ishini tahlil qilish uchun esa simulyatsion laboratoriya yetarli. Ishlab turgan quyosh elektr stansiyasining real ma’lumotlarini tahlil qilish uchun raqamli egizak eng mos keladi.

Virtual laboratoriyalar muhandislik ta’limida amaliy tayyorgarlikni takomillashtirishning samarali vositasi bo‘la oladi, lekin faqat ular bir xil vosita emas, balki turli imkoniyatlarga ega texnologiyalar oilasi sifatida qaralganda. Real obyektdan to‘liq virtual muhitgacha bo‘lgan spektr, olti mezon bo‘yicha qiyoslash va o‘quv maqsadiga asoslangan tanlash algoritmi o‘qituvchiga har bir mashg‘ulot uchun eng mos laboratoriya turini asosli tanlash imkonini

beradi. Natijada real laboratoriyaning cheklangan resursi aynan u almashtirib bo‘lmaydigan vazifalarga sarflanadi.

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