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Uporaba NTC metode pri otrocih v prvih treh letih

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KLJUČNE BESEDE: NTC metoda, predšolski otrok, vzgojitelji, zgodnji razvoj

POVZETEK – V teoretičnem delu avtorici poudarjata pomen učenja po NTC metodi v zgodnjem otroštvu, natančneje do tretjega leta starosti. Z ustreznim vzgojnim delovanjem lahko odrasli vplivamo na razvoj sinaps v možganih, ki prispevajo k razvoju bioloških potencialov. Razumevanje tega je ključno pri vzgojiteljih predšolskih otrok, saj se otrok lahko vključi v vrtec že z dopolnjenimi 11. meseci starosti. V empiričnem delu smo zato raziskali poznavanje in uporabo NTC metode s strani strokovnih delavcev v vrtcu. S pomočjo anketnih vprašalnikov smo pridobile podatke obdelali na ravni deskriptivne in inferenčne statistike. Ugotovili smo, da vzgojiteljice sicer poznajo omenjeno metodo, je pa mnoge še niso uporabile. Tiste, ki jo uporabljajo pri svojem delu, pa zaznavajo velike spremembe pri hitrejšem razvoju otrokovih potencialov na različnih razvojnih področjih.

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ABSTRACT – In the theoretical part, the authors emphasize the importance of using the NTC method in early childhood, specifically until the child reaches three years of age. Through appropriate educational practices, adults can influence the development of synapses in the brain, which contribute to the development of biological potential. Understanding this is crucial for preschool educators, as children can enter kindergarten as early as 11 months old. In the empirical part, we investigated the knowledge and implementation of the NTC method by professionals in the preschool setting. Through survey questionnaires, we processed the obtained data using descriptive and inferential statistics. We found that while educators are familiar with the aforementioned method, many have not yet utilized it. However, those who have applied it in their work perceive significant improvements in the faster development of children's potential in various developmental areas.

1 Uvod

Zelo pomemben okvir za oblikovanje koncepta predšolske vzgoje v vrtcu predstavlja poznavanje otrokovega razvoja, ki poteka skozi določene zaporedne stopnje (Bahovec, 1999). Temeljna področja otrokovega razvoja so telesni, spoznavni, čustveno-osebnostni in socialni razvoj. Med seboj so tesno povezana, vendar jih bomo predstavili ločeno. Pri telesnem razvoju gre predvsem za telesne spremembe, razvoj gibalnih in zaznavnih sposobnosti in spretnosti. Vse spremembe v intelektualnih procesih, razvoj govora, spomina, sklepanja, mišljenja, učenja, presojanja in reševanja problemov spada k spoznavnemu razvoju. K čustveno-osebnostnemu razvoju prištevamo spremembe v doživljanju, uravnavanju in izražanju čustev ter načinov, po katerih se posameznik odziva na okolje. Pri socialnem razvoju pa gre za razvoj medosebnih odnosov, komunikacije, socialnega razumevanja in spretnosti (Lindenberger in Reischies, 1999, v Marjanovič-Umek in Zupančič, 2009).

Rajović (2019) meni, da je nujno pogledati v prihodnost in razvijati strategije dela v vrtcih, ki se prilagajajo spreminjajočemu se okolju, ki vpliva na razvoj sposobnosti otroka. Dokaz napredka pri razvoju otrok so pokazale tudi različne študije, ki so jih izvajali v Sloveniji in na Hrvaškem pri predšolskih otrocih. Pri otrocih, ki so nekaj mesecev vsakodnevno izvajali NTC dejavnosti, so bile dokazane izboljšave na številnih področjih otrokovega razvoja.

2 Teoretični uvod

Program NTC učenja (NTC – Nurture of Talented Children) je sestavljen iz različnih iger za otroke, ki izhajajo iz spoznanj o delovanju in razvoju možganov in ki zaradi rezultatov različnih raziskav zelo dobro vplivajo na nastajanje in utrjevanje sinaps med nevroni v času najintenzivnejšega razvoja otroka, to je od rojstva ter neke do desetega leta starosti (Jurišević idr., 2010). Center za izobraževanje ga je razvijal v sodelovanju z drugimi izobraževalnimi ustanovami, ki že leta delajo na izboljševanju intelektualnih sposobnosti otrok. Avtor programa dr. Ranko Rajović je z ekipo strokovnjakov iz različnih področij – pedagogike, psihologije, defektologije, nevrofiziologije, genetike – oblikoval enostaven in učinkovit program z možnostjo spremljanja in merjenja doseženih rezultatov. Osnovno načelo Rajovića je bilo povezati nevrofiziološka spoznanja z uradnim izobraževanjem, torej, kot je rekel sam, “izkoriščanje potencialov človeškega uma in moč otroštva v kombinaciji s predanimi starši in vzgojitelji odpira vrata bolj ustvarjalnemu učenju, hitrejšemu znanju in lažjemu odkrivanju in razvoju sposobnosti otroka” (Rajović, 2019). In ravno v tem obdobju lahko skozi igro najuspešneje stimuliramo nove povezave med nevroni, s tem večamo sposobnost za učenje ter spodbujamo razvoj posameznika in posledično tudi naroda (Rajović, 2013).

Namen NTC programa je pri otrocih spodbuditi, da bi v čim večji meri izkoristili svoj biološki potencial. Inteligentnost ni odvisna zgolj od živčnih celic, ki so genetski dejavnik, temveč tudi od števila sinaps, to so povezave med nevroni, ki se v obdobju do sedmega leta starosti najbolj razvijajo (Rajović, 2016). Po mnenju Poljšak Škraban idr. (2018, str. 137–138) je ključna stalna uporaba možganov v vseh letih otrokovega razvoja, saj s tem največ prispevamo k ustreznemu razvoju.

V zgodnjem obdobju, ko je razvoj možganov najbolj intenziven, z uporabo aktivnosti in preventivnih vaj otrokom pomagamo, da si v celoti razvijejo svoje biološke potenciale. Žal pa je vedno več otrok z motnjami v razvoju, predvsem zaradi pomanjkanja gibalnih aktivnosti, kar vpliva na zmanjšanje prostornine posameznih možganskih regij – bazalnih ganglijev. Še eden izmed razlogov za to je pretirana raba tehnologije. Kot poudarjata Cvek in Pšunder (2019) je tehnologija del odraščanja mladih, zato jim uporabe ne moremo povsem preprečiti. Lahko pa jih seznanimo z nevarnostmi in pastmi ter ozaveščamo varno in zmerno rabo. Še bolje pa je, kot izpostavita Dubovicki in Balen (2018, str. 168–169), s čim bolj zgodnim vključevanjem računalniške/medijske pismenosti naučiti mlade ustrezne uporabe tehnologije v svoj prid oz. boljši razvoj sebe in svojih znanj. Pomaga lahko tudi na področju gibanja oziroma motorike, če je le ustrezno načrtovano.

Gljučni element prve faze so dejavnosti, za katere so značilne kompleksne motorične sposobnosti, ki vključujejo tudi elemente fine motorike, dinamičnega prilagajanja očesa, rotacije, ravnotežja, koordinacije in gibanja. Te dejavnosti aktivirajo velike regije možganske skorje in spodbujajo njihovo medsebojno povezanost, kar posledično pripomore h kognitivnemu razvoju (Rajović, 2019). Pomembno vlogo gibanja v zgodnjem obdobju poudarja tudi kurikulum, saj je potreba po gibanju primarna otrokova potreba, ki poteka od preprostih in naravnih oblik gibanja pa vse do zahtevnejših. Z gibanjem si otroci pridobivajo gibalne izkušnje, razvijajo gibalne sposobnosti, usvajajo gibalne koncepte, razvijajo intelektualne, socialne in emocionalne veščine (Bahovec, 1999). Motorične dejavnosti zagovarja tudi Rajović, saj pravi, da so osnova za uspešno gibanje in reševanje motoričnih nalog, to so predvsem vaje za ravnotežje, dinamično prilagajanje očesa, vaje za rotacijo ter vaje za finomotoriko (Rajović, 2016).

Najpogostejše ovire pri razvoju otroka so: prezaščenost otrok, premalo kontrasta ob rojstvu, fiksiranje glavnice, predolgo časa mu dajemo mehko hrano, otroku prepovedujemo, da se plazi, da skače in da se vrti okrog svoje osi, otroci se premalo gibajo in hodijo, kupovanje čevljev na ježke, otroci ne hodijo bos, nakup računalnika, telefona, TV ... (Teran Košir, 2016). Rajović (2017) poudarja problem prevelike prezaščenosti otroka s strani staršev, saj se bojijo, da bi padel, se poškodoval, dal kaj v usta in mu s tem preprečujejo, da bi delal stvari, s katerimi razvija svoje potenciale. Pomembno je, da naredimo vse za varnost otroka, a da ga ob tem ne omejujemo. Ne prepovedujemo mu skakanja, ampak bodimo zraven, da preprečimo morebitne poškodbe. S tem se strinja tudi Juul (2015), ki ugotavlja, da so otroci tako zaščiteni pred svetom in življenjem, da ne morejo funkcionirati in postanejo nesposobni.

Vse to je s svojim stavkom "Pomagaj mi, da naredim sam." povedala že Maria Montessori. Z natančnim opazovanjem otrok je ugotovila, da je želja otrok po neodvisnosti zelo velika in da se otroci ob urjenju samostojnosti zelo zabavajo in so, če jim dovolimo, da to naredijo samostojno, veliko bolj zadovoljni kot otroci, namesto katerih vse naredimo mi (Seldin, 2018).

Prva največja spodbuda za razvoj sinaps se pojavi takoj ob rojstvu otroka. Otrok od rojstva do prvega meseca starosti vidi motno, zato je zelo pomembno, da mu takrat ponudimo čim bolj kontrastno okolje (Rajović, 2017). To je pred leti odkrila tudi Maria Montessori, ki poudarja, da se dojenčki že rodijo s prirojenim čutom za ustvarjalnost, z inteligentnostjo in z radovednostjo, zato je pomembno, da jim nudimo raznoliko okolje, kjer bodo lahko do popolnosti razvili svoj biološki potencial, saj vsrkavajo vse, česar se dotaknejo, vidijo, slišijo ali vonjajo (Seldin, 2018). Z raziskavami je tudi dokazano, da takoj po rojstvu na razvoj otroka najbolj vpliva prav spodbujevalno okolje (Ibuka, 1992). Spodbujati moramo razvoj impulzov v možganih in to naredimo najbolje s spodbujanjem čutov, motorike, z aktiviranjem prstkov, razgibavanjem stopal in čutenjem z njimi (pri bosih hoji), s prilagajanjem oči (gledanjem na blizu in daleč, recimo pri povsem preprostem žoganju). Impulze spodbudimo s tem, ko otroku v pravem času ponudimo trdo hrano in ne zavlačujemo predolgo s pretlačenimi kašami, kjer otroku ni treba vključiti tistih možganskih centrov, ki skrbijo za grizenje, okušanje, delo jezika, zob, čeljusti ... Nove raziskave kažejo, da lahko manjši vnos impulzov v korteks prinaša težave v kognitivnem razvoju (Rajović, 2017).

Edini način, da živčne celice ne odmrejo, je, da nekaj delajo. Ko otrok skače, se vrti, se giblje, mora aktivirati vse mišice v telesu, uravnavati ravnotežje, s čimer pošilja v možgane veliko impulzov za razvoj novih in novih sinaps (Mlakar Grandošek, 2016). S tem ko otroku pustimo, da skače po lužah, trampolinu, kavču, preskakuje ovire v naravi ali pleza po drevesih, razvijamo njegovo inteligenco. Inteligenca je zbiranje in uporaba informacij, kar je najpomembnejša naloga možganov; otrok instinktivno skače zato, da si razvija sinapse in možgane, s tem si pridobiva izkušnje, s katerimi si razvija kognitivne sposobnosti (Rajović, 2018). Majhni otroci se zelo radi vrtijo okrog svoje osi, vendar jim starši to preprečujejo, da se jim ne bi zvrtilo. Danes je v medicini znano, da otroci s temi gibi razvijajo sinapse v možganih za razvoj inteligence (Teran Košir, 2016). Gre za enega najbolj zahtevnih premikov v prostoru, ki mora nujno biti razvit v zgodnjem življenjskem obdobju (Rajović, 2013).

Naslednji problem je, da današnji predšolski otroci sploh ne hodijo ali hodijo premalo (do drugega, tretjega leta se vozijo v vozičku, v šolo pa jih vozijo z avtom). Hoja pa je za otroke najpomembnejša, saj se jim možgani še razvijajo in če otroci ne bodo hodili, ne bo optimalnega razvoja struktur v možganih. Ne gre pa samo za hojo. Rajović poudarja predvsem pomen bose hoje, saj otroci, ki hodijo bosi, pošiljajo na tisoče dodatnih impulzov v možgane (Banjanac Lubej, 2015). Bosa hoja vpliva na razvoj možganov, kajti na podplatu imamo izjemno veliko živčnih končičev, ki jih z boso hojo veliko bolj vzdražimo in spodbudimo kot s hojo v obuvalu. Preko bosega podplata tudi veliko bolj občutimo podlago, po kateri hodimo, se veliko bolj proprioceptivno odzovemo, skratka dobimo veliko več informacij o podlagi, po kateri hodimo, in se posledično temu tudi lažje odzovemo, prilagodimo gibalno (Ščuka, 2019). Breclj (1997) ob tem poudarja, da je za normalen razvoj stopala pomembna popolna svoboda gibanja, ki pristno ohranja dotik s podlago, ki je zelo pomemben za razvoj hoje kot skladnega in pravičnega delovanja mišic, ki sodelujejo pri hoji, zato naj otroci v toplih dneh hodijo bosi, če pa je mrzlo, pa so za njihove prve korake najprimernejša obutev nogavičke s stopalnim delom, ki preprečuje drsenje.

Razvoj otrokovega potenciala je dinamičen in kompleksen proces poudarja Rajović (2016), ki zahteva sodelovanje velikega števila dejavnikov, med katerimi so na prvem mestu družina, posameznik in družbeno okolje. Raziskave so potrdile, da je aktivno angažiranje oseb, ki z otroki preživijo največ časa, pomembnejše za razvoj sposobnosti kot pa izobrazba ali status, kar pomeni, da te osebe pomagajo pri razvoju otrokovih zanimanj, nudijo podporo njegovemu intelektualnemu odkrivanju, kar pa spodbuja razvoj nadarjenosti. Tudi v Kurikulumu za vrtce (1999) je zelo poudarjena vloga staršev in sodelovanje med vrtcem in starši, ki veliko prispeva k ustreznemu dopolnjevanju institucionalne in družinske vzgoje ter posledično tudi h kakovosti vrtca. Zelo pomembna je delitev odgovornosti in pristojnosti, medtem pa moramo biti pozorni, da vrtec staršem nudi storitve, spoštuje njihovo kulturo, jezik, identiteto, vrednote, navade, prepričanja, prav tako pa morajo starši upoštevati meje soodločanja in ne smejo posegati v vzgojiteljevo strokovnost oz. v strokovnost same institucije. To pa je vedno težje zagotoviti, ugotavlja Švab (2001, v Hmelak, 2017, str. 6) in nadaljuje, da je prišlo v oblikah in vlogah družine do velikih sprememb. Pojavila se je pluralizacija družinskih oblik, materinski tip vzgoje, novo očetovstvo, otrokocentrizem, kar pomeni, da je v družini v ospredju otrok in da starši zanj naredijo vse, da ga obvarujejo pred najrazličnejšimi nevarnostmi. Zato Rajović (2016) poudarja pomembno vlogo vrtca, ki naj ustvari spodbudno okolje

za spodbujanje motivacije ter pozitivne naravnosti do izobraževanja in znanja. Če namreč v tem najzgodnejšem obdobju otroka ne spodbujamo, se nekatere funkcije ne razvijejo popolnoma, zato je zelo pomembno, da starši prepoznajo otrokove potrebe, saj le tako lahko pomagajo svojemu otroku in ga spodbujajo k tistim dejavnostim, ki pripomorejo k boljšemu razvoju dela možganov, zadolženega za določeno večino. Z ustvarjanjem predpogojev bo otrok lažje izkoriščal svoje zmogljivosti za različne miselne procese v življenju. Pri tem pa ima pomembno vlogo tudi vrtec, predvsem v razvoju dinamičnega vida, ki je lahko v primeru slabše razvitosti vzrok za slabši uspeh v šoli zaradi zmanjšane koncentracije in zaradi možnosti razvoja disleksije. Jurišević idr. (2010) menijo, da je problem predvsem v gledanju televizije in igranju video igrice, saj s tem negativno vplivamo na razvoj akomodacije očesa, za katero je zelo pomembno, da se razvije ravno v tem obdobju. Ta proces se razvija z aktivnostjo oči, hitrimi gibi, česar pa pri tem ni. Če otroku na pot postavljamo vse te ovire in mu ne pomagamo, da bi jih prešel v času do tretjega leta, bo imel razvitih manj sinaps v mnogih pomembnih delih možganov. Kasneje to lahko povzroča težave v šoli ali že pred šolo (izgovorjava, govor ...).

Pridobivanje izkušenj je tesno povezano z gibanjem, saj gibanje otroku omogoča učenje, torej se uči z gibanjem. Vpliv gibanja na razvoj je vsestranski skozi vse življenje, vendar avtorji menijo, da je najmočnejši ravno v zgodnjem otroštvu. Po mnenju mnogih avtorjev je največ, kar lahko naredimo za otrokov gibalni razvoj, zagotovitev naravnega gibalnega razvoja z optimalnim okoljem in čim manjšim omejevanjem letnega (Papalia idr., 2003, v Jelovčan idr. 2020, str. 25).

Namen raziskave

Namen raziskave je bil spoznati NTC metodo, s poudarkom na uporabi pri delu z mlajšimi otroki, to je pri otrocih od rojstva do tretjega leta starosti.

3 Metodologija

Uporabili smo deskriptivno in kavzalno-eksperimentalno metodo empiričnega pedagoškega raziskovanja.

V raziskovalni vzorec smo zajeli vzgojiteljice in vzgojitelje prvega starostnega obdobja iz različnih vrtcev po Sloveniji. Vzorec je neslučajnostni, priložnostni. Obdelanih je bilo 136 v celoti izpolnjenih anket. V raziskavi je sodelovalo 99,0% žensk (vzgojiteljic) in samo 1,0% moških (vzgojiteljev). Največ anketirancev (71,0%) v skupini prvega starostnega obdobja je zaposlenih do 10 let. Sledijo anketiranci (17,0%), ki so zaposleni od 11 do 20 let, nato anketiranci (7,0%), zaposleni od 21 do 30 let. Najmanj anketirancev (6,0%) je v prvem starostnem obdobju zaposlenih od 31 do 40 let.

Za zbiranje podatkov smo uporabili anonimni anketni vprašalnik. Vprašalnik smo preko aplikacije Ika posredovali na spletne naslove ravnateljcev in ravnateljic vrtcev ter na skupine vzgojiteljic na spletnih straneh. Ciljna skupina so bili zaposleni v prvem (1–3 leta starosti) starostnem obdobju.

Pridobljene podatke smo obdelali s kvantitativno obdelavo, uporabili smo deskriptivno in inferenčno statistiko. Na podlagi dobljenih rezultatov smo spremenljivke prikazali tabelarično z absolutnimi in relativnimi frekvencami ($f\%$). Poleg omenjenega smo pri obdelavi podatkov uporabili še Pearsonov hi-kvadrat test.

4 Rezultati in interpretacija

V nadaljevanju predstavljamo analize odgovorov, pridobljenih z anketnim vprašalnikom.

Najprej nas je zanimalo, ali so vzgojitelji pri svojem delu že uporabili NTC metodo.

Tabela 1

Število (f) in odstotki ($f\%$) vzgojiteljev glede uporabe NTC metode učenja pri delu

<i>Odgovori</i>	<i>f</i>	<i>$f\%$</i>
Da	55	40,0
Ne	81	60,0
Skupaj	136	100,0

Kot je razvidno iz tabele, več kot polovica anketirancev (60,0%) še ni uporabljala NTC metode učenja, med tem ko slaba polovica anketirancev (40,0%) uporablja NTC metodo učenja z otroki v prvem starostnem obdobju.

Program NTC je program aktivnosti, namenjen spodbujanju razvoja gibalnih in kognitivnih sposobnosti pri predšolskih otrocih. /.../ Gibalni razvoj ima ključno vlogo pri kognitivnem razvoju otroka, nekateri problemi (kot so motnje učenja, problemi koncentracije in pomanjkanje pozornosti) pa so lahko prav posledica neustreznega motoričnega razvoja in sodobnega življenjskega sloga (Rajović, 2019). Zato je zelo pomembno, da se zviša odstotek anketirancev, ki uporabljajo NTC metodo učenja v prvem starostnem obdobju, kar lahko dosežemo s pomočjo izobraževanj in ozaveščanj strokovnih delavcev.

Ker smo želeli pri anketirancih, ki so odgovorili, da so že uporabljali NTC metodo učenja, preveriti, če so jo res, smo jih zaprosili, da navedejo nekaj konkretnih primerov. V tabeli 2 navajamo nekaj najpogostejših primerov, ki so jih zapisali vzgojitelji. Združili smo jih po podobnosti.

Tabela 2*Primeri NTC sistema učenja*

Št.	Odgovori
1	Izdelovanje žogic iz papirja in serviet ter metanje le-teh v škatlo.
2	Učenje s poskušanjem.
3	Montessori dejavnosti.
4	Hoja po različnih materialih – čutna pot, dejavnosti z žogo, prestopanje elastike, plazenje pod elastiko, ples, petje pesmic s ploskanjem, pesmica s slikami – narišem sama ali izrežem iz Cicidoja, dejavnosti za razvoj fine motorike (prijemanje, vtikanje, pretikanje ...), poganjači, spodbujanje obuvanja in sezuvanja.
5	Gibanje, hoja po črti, simboli v kotičkih.
6	Pajkova mreža, vrtenje, uganke.
7	Urjenje fine motorike, poligoni z različnimi materiali.
8	Vaje za ravnotežje in dinamično prilagajanje očesa, vaje za finomotoriko.
9	Slikovni prikaz pesmic.
10	Viseče žoge, učenje s simboli, vrtenje.
11	Gibanje v korelaciji s štetjem.
12	Pajkova mreža, čutna pot, igra z naravnimi materiali, prestopanje ovir.
13	Razne oblike gibanja, vrtenje, hoja nazaj.
14	Telesno gibalne igre, grafomotorične igre, glasbene dejavnosti, ples.
15	Vrtenje z obročem, igre z žogo.
16	Asociativno povezovanje glasbenih vsebin (slika nas asociira na pesem), vrtenje, hoja po črti.
17	Vaje za prilagajanje očesa, igre z žogo.
18	Veliko gibalnih dejavnosti na prostem.
19	Vrtenje okoli svoje osi.
20	Po predavanju Rajovića.
21	Razvrščeni predmeti po prostoru, ki jih otroci poberejo in ustrezno razvrstijo.
22	Slikopis, uganke, gibalni izzivi, simboli.
23	Gibanje, pesmi, deklamacije.
24	Opazovanje slik z manjkajočimi deli, učenje pesmic s simboli.
25	Igre z žogo, vrtenje okoli svoje osi, slikaniški modeli pravljic in pesmic.
26	Pajkova mreža z volno, hoja z bosimi nogami po različnih naravnih terenih.
27	Pesmi v slikah, NTC igre, gib. poligon, ples, uganke, skriti predmeti.
28	Grafomotorične vaje, igra s simboli.
29	Predvsem gibalne naloge z elementi NTC-ja (drobna motorika, grafomotorične vaje, vaje za akomodacijo, vaje z asociacijami); učenje pesmic v slikah.
30	Otrok na eni strani igralnice pogleda sliko, na kateri so pomladne rožice, nato gre na drugo stran igralnice, med tem vozi slalom med stožci, poišče enako sličico rožice, ki je na sliki pomladnih rastlin, jo vzame, gre nazaj na drugo stran igralnice, med tem vozi slalom med stožci in sliko pritrdi zraven enake pomladne rožice.

Št.	Odgovori
31	Učenje skozi igro.
32	Gibanje v korelaciji s štetjem.
33	Bosonoga hoja, uganke ob sličicah, pesmice v slikah.
34	Igre s senzoričnimi vrečkami.
35	Vtikanje palčk v reže, natikanje po oblikah, kotaljenje, plazenje pod mizo.
36	Hoja po različnih površinah.
37	Opazovanje slik z manjkajočimi deli.
38	Asociacije, ravnotežje.
39	Asociativno povezovanje glasbenih vsebin (slika nas asociira na pesem).
40	Hoja po vrvici, iskanje parov.
41	Skakanje po trampolinu, tekanje v gozdu s premagovanjem ovir.
42	Simbolne igre, prepoznavanje logotipov.
43	Igra z naravnimi materiali.
44	Spodbujanje obuvanja, sezuvanja, poganjalčki.

Ugotovili smo, da so navedeni primeri res primeri NTC učenja, saj jih kot takšne navaja tudi Rajović (2016). V nadaljevanju (tabela 3) smo odgovore vzgojiteljev kategorizirali in izpeljali štiri kategorije, ki so razvrščene po pogostosti. Kategorije smo naredili na podlagi dejavnosti NTC sistema učenja.

Tabela 3

Kategorije NTC primerov, rangiranih po pogostosti

Rang	Kategorija	Frekvenca
1	Telesno-gibalne igre	38
2	Igre za akomodacijo	21
3	Pomnjenje z asociacijami	19
4	Grafomotorične igre	17

Prvi sklop dejavnosti so dejavnosti za spodbujanje razvoja sinaps v možganih. Sem spadajo telesno-gibalne igre, igre za akomodacijo in grafomotorične igre. V drugi sklop dejavnosti spadajo dejavnosti za spodbujanje pomnjenja z asociacijami. K tem prištevamo igre s simboli, igre spomina in glasbene dejavnosti (Rajović, 2019). Vse te dejavnosti so anketiranci zajeli v svojih odgovorih. Najpogosteje uporabljajo telesno-gibalne igre, najredkeje pa grafomotorične igre. Našteli so veliko različnih primerov NTC učenja, ki so zabeleženi v tabeli 2.

V nadaljevanju nas je zanimalo, ali lahko ob redni uporabi NTC metode učenja napreduje vsak otrok. Velika večina anketirancev (63,0%) meni, da lahko ob redni uporabi NTC metode napreduje vsak otrok, sledijo anketiranci (32,0%), ki so mnenja, da

otroci lahko napredujejo, vendar malo. Najmanj anketirancev (4,0 %) pa je mnenja, da otroci ob redni uporabi NTC metode ne napredujejo. Ta rezultat nas je zelo presenetil, saj samo 40,0 % anketirancev uporablja NTC metodo v prvem starostnem obdobju, medtem ko jih 96 % meni, da ob njeni redni uporabi napreduje vsak otrok. Iz tega je razvidno, da 56 % anketirancev, ki pri svojem delu ne uporabljajo NTC metode, meni, da ob njeni redni uporabi napreduje vsak otrok.

Preverili smo še morebitne statistično značilne razlike pri napredovanju glede na delovno dobo v prvem starostnem obdobju in ugotovili, da ni statistično značilnih razlik med mnenji o napredovanju vsakega otroka glede na delovno dobo vzgojiteljev v prvem starostnem obdobju ($P = 0,456$). Največ anketirancev (70,9 %) meni, da lahko ob redni uporabi NTC metode napreduje vsak otrok tistih, ki v prvem starostnem obdobju delajo do 10 let. Najmanj anketirancev (3,5 %) pa to meni o tistih, ki v prvem starostnem obdobju delajo od 31 do 40 let.

Vsem anketirancem, ki so na predhodno vprašanje odgovorili pritrdilno, teh je bilo 96 %, smo zastavili še podvprašanje, in sicer kaj menijo, na katerih področjih razvoja in v kolikšni meri otrok napreduje. Rezultati so prikazani v tabeli 4.

Tabela 4

Področja napredovanja

Področja	Malo		Srednje		Veliko		Skupaj	
	<i>f</i>	<i>f</i> %	<i>f</i>	<i>f</i> %	<i>f</i>	<i>f</i> %	<i>f</i>	<i>f</i> %
Na gibalnem oz. motoričnem področju.	8	6,0	39	30,0	82	64,0	129	100,0
Na spoznavno-zaznavnem področju.	3	2,0	40	31,0	86	67,0	129	100,0
Na čustveno-osebnostnem področju.	5	4,0	57	44,0	68	52,0	130	100,0
Na socialnem področju.	10	8,0	53	41,0	66	51,0	129	100,0

Največ vzgojiteljev meni, da otroci najbolj napredujejo na spoznavno-zaznavnem področju razvoja (67,0 %), sledi gibalno oz. motorično področje razvoja (64,0 %), nato pa čustveno-osebnostno in socialno področje.

5 Sklep

Rezultati ankete kažejo, da v vrtcu v prvem starostnem obdobju slaba polovica anketirancev (40,0 %) uporablja NTC metode učenja. Kar 96,0 % anketirancev pa meni, da ob redni uporabi NTC metode napreduje vsak otrok. To je presenetljivo, saj je 55,0 % tudi tistih anketirancev, ki ne uporabljajo NTC metode učenja v prvem starostnem obdobju. Vendar so tudi anketiranci (4,0 %), ki menijo, da otroci ob redni uporabi NTC metode učenja ne napredujejo. Glede na dane rezultate in na dejstvo, da tudi tisti anke-

tiranci, ki ne uporabljajo NTC metode v prvem starostnem obdobju, menijo, da lahko napreduje vsak otrok, smo na dobri poti, da se odstotek v prid uporabe NTC metode v prvem starostnem obdobju zviša s pomočjo primerov NTC učenja, ki smo jih našli tudi v tem članku.

Skoraj vsi znanstveniki se strinjajo, da je po rojstvu razvoj možganov skoraj v celoti odvisen od otrokovega okolja. Možgani imajo na primer prirojene lastnosti, ki nam omogočajo razvoj govora, vendar sta dejanski razvoj možganskih funkcij in oblikovanje možganske “pokrajine” popolnoma odvisna od zunanjih spodbud. Vse, s čimer pridejo otroci v stik v odločilnih najzgodnejših letih življenja, položi temelj vseh nadaljnjih življenjskih izkušenj (Seldin, 2018). Tudi Rajović ugotavlja, da je vsaka generacija otrok vsako leto slabša. Kar 50 odstotkov slovenskih otrok ima težave na področju branja, pisanja ali matematike ter pri šestih letih s fino motoriko. Otroci imajo težave s prilagajanjem oči, z velikimi področji v možganih, ki uravnavajo delo prstov, govora ... Vsaka od teh možganskih regij je izredno pomembna za razvoj kognitivnih sposobnosti. Na prvo mesto postavlja odgovornost staršev, saj so oni tisti, ki bi se morali zavedati, da škodujejo otrokovemu razvoju, predvsem s tem, ko vse naredijo namesto otroka, ko mu ne pustijo skakati po lužah, ko mu omejujejo gibanje in ga “zavijajo v vato” (Teran Košir, 2019).

S to raziskavo smo dobili sliko o trenutnem razmišljanju strokovnih delavcev vrtca. Na tej podlagi pa bi lahko razvijali naprej. V prvi vrsti s konceptom šole za starše pred rojstvom otroka, kjer bi jih seznanili z vsemi pozitivnimi učinki zgodnjega spodbujanja otroka, z napakami, katerim se morajo pri vzgoji izogibati, z dejavnostmi, ki jih naj izvajajo, z izkušnjami, ki jih naj ponudijo otroku, kasneje pa to delo nadaljevati s strokovnimi delavci v vrtcu ter jih obogatiti z znanjem in primeri NTC dejavnosti v prvem starostnem obdobju, kajti le tako bomo pripomogli k celovitemu razvoju vsakega otroka.

Maja Hmelak, PhD, Anita Kirbiš

Use of the NTC Method in Children's First Three Years of Life

A very important framework for the conceptualisation of preschool education in kindergarten is the knowledge of child development, which proceeds through certain sequential stages (Bahovec, 1999). The fundamental areas of child development are physical, cognitive, emotional-personal and social development. They are closely inter-related, but will be presented separately. Physical development is primarily concerned with physical changes, the development of motor and cognitive abilities and skills. All changes in intellectual processes, the development of speech, memory, reasoning, thinking, learning, judgement, problem-solving, are part of cognitive development. Emotional-personality development includes changes in the experience, regulation and expression of emotions, and the ways in which the individual responds to the environment. Social development is the development of interpersonal relationships, communication, social understanding and skills (Lindenberger and Reischies, 1999, in Marjanovič-Umek and Zupančič, 2009).

The NTC Learning Programme (NTC – Nurture of Talented Children) consists of a variety of games for children, based on the knowledge of brain function and development, which, thanks to the results of various research studies, have a very good effect on the formation and consolidation of synapses between neurons during the most intensive development of the child, i.e., from birth until somewhere around the age of 10 (Jurišević et al., 2010). It has been developed by the Centre for Education in collaboration with other educational institutions that have been working for years on improving the intellectual abilities of children. The author of the programme, Dr Ranko Rajović, together with a team of experts from different fields – pedagogy, psychology, special education, neurophysiology, genetics – designed a simple and effective programme with the possibility of monitoring and measuring the results achieved. Rajović's basic principle was to link neurophysiological knowledge with formal education, i.e., as he himself said, "harnessing the potential of the human mind and the power of childhood, combined with dedicated parents and educators, opens the door to more creative learning, faster knowledge, and easier discovery and development of a child's abilities" (Rajović, 2019). It is during this period that new connections between neurons can be most successfully stimulated through play, increasing the capacity to learn and promoting the development of the individual and, consequently, of the nation (Rajović, 2013).

The most common obstacles to child development are: overprotection of children; lack of contrast at birth; fixation of the head; giving the child soft food for too long; forbidding the child to crawl; forbidding the child to jump and to rotate around his or her axis; children not moving and walking enough; buying shoes with Velcro straps; children not walking around barefoot; buying a computer, a phone, a TV, etc. (Teran Košir, 2016). Rajović (2017) highlights the problem of the overprotection of children by their parents, who are afraid of the children falling, hurting themselves, putting something in their mouths and thus prevent them from doing things that develop their potential. It is important to do everything to keep the child safe, but we must not restrict the child in the process. We should not forbid the child to jump, but should be there to prevent any injuries. Juul (2015) agrees, noting that children are so sheltered from the world and life that they are unable to function, becoming incapacitated.

Maria Montessori said it all with her phrase "Help me to do it myself". By closely observing children, she found that children's desire for independence is very strong, that children have a lot of fun when they are trained to be independent, and that, if allowed to do things independently, they are much happier than the children for whom we do everything (Seldin, 2018).

The first major stimulus for synapse development occurs immediately after birth. From birth until the first month of age, the child's vision is blurred, so it is very important to offer him or her as contrasting an environment as possible at that time (Rajović, 2017). This was also discovered years ago by Maria Montessori, who emphasised that babies are already born with an innate sense of creativity, intelligence and curiosity, so it is important to offer them a varied environment where they can develop their biological potential to the fullest, as they absorb everything they touch, see, hear or smell (Seldin, 2018). It has also been proved through research that it is the stimulating environment that has the greatest impact on a child's development immediately after birth (Ibuka, 1992). We need to stimulate the development of impulses in the brain and this is best done by stimulating the senses, motor skills; by activating the toes; by flexing the

feet and feeling with them (when walking barefoot); by adjusting the eyes (looking near and far, for example, when doing a very simple ball exercise). Impulses are stimulated by offering the child solid food at the right time and not delaying it too long with mashed cereals, where the child does not have to engage those brain centres that are responsible for biting, tasting, tongue, teeth, jaw work, etc. New research shows that less impulse input to the cortex can lead to problems in cognitive development (Rajović, 2017).

The development of a child's potential is a dynamic and complex process, emphasises Rajović (2016), which requires the cooperation of a large number of factors, among which the family, the individual and the social environment are of primary importance. Research has confirmed that the active involvement of the people who spend the most time with children is more important for the development of abilities than education or status. This means that these people help to develop the child's interests and provide support for his or her intellectual discovery, which in turn fosters the development of giftedness. The Kindergarten Curriculum (1999) also places great emphasis on the role of parents and the cooperation between kindergarten and parents, which contributes greatly to the appropriate complementarity between institutional and family education and, consequently, to the quality of kindergarten. The division of responsibilities and competences is very important, but in the meantime, it is important to ensure that the kindergarten provides a service to parents that respects their culture, language, identity, values, habits and beliefs, and that parents respect the limits of participation and do not interfere with the professionalism of the teacher or of the institution itself. This is increasingly difficult to ensure, notes Švab (2001, in Hmelak, 2017), who goes on to say that there have been major changes in the forms and roles of the family. We are encountering a pluralisation of family forms, a maternal type of upbringing, a new fatherhood, child-centredness, which means that the child is at the centre of the family, and that parents do everything to protect him or her from all kinds of dangers. Rajović (2016) therefore emphasises the important role of the kindergarten in creating a supportive environment to foster motivation and positive attitudes towards education and knowledge. This is because some functions may not develop fully if the child is not stimulated at this early stage. It is very important for parents to recognise their child's needs, as this is the only way to help their child and encourage him or her to engage in activities that help the part of the brain responsible for a particular skill to develop better. By creating preconditions, the child will be better able to use his or her capacities for the different thought processes in life. Kindergarten also has an important role to play here, especially in the development of dynamic vision, which, if less developed, can lead to poorer performance at school due to reduced concentration and the possibility of developing dyslexia. Jurišević et al. (2010) believe that the problem lies mainly in watching television and playing video games, as this has a negative impact on the development of accommodation of the eye, which must develop during this period. This process is developed by eye activity, rapid movements, which is not the case here. If we put all these obstacles in the child's path and do not help him or her to overcome them by the age of three, the child will have developed fewer synapses in many important parts of the brain. Later on, this can cause problems at school or even before school (pronunciation, speech, etc.).

The results of the survey show that less than half of the respondents (40%) use NTC teaching methods in kindergarten in the first age group. However, 96% of the respond-

ents believe that every child makes progress when using the NTC method regularly. This is surprising, as 55% of these respondents do not use the NTC method of learning in the first age period. However, there are also respondents (4%) who think that children do not make progress when using the NTC method of learning regularly. Given these results and the fact that even those respondents who do not use the NTC method in the first age period think that every child can make progress, we are well on the way to increasing the percentage in favour of using the NTC method in the first age period. The examples of NTC learning that we have listed in this article can be of help.

Almost all scientists agree that after birth, brain development is almost entirely dependent on the child's environment. For example, the brain has innate properties that allow us to develop speech, but the actual development of brain functions and the formation of the brain's 'landscape' are entirely dependent on external stimuli. Everything that children come into contact with in the crucial earliest years of life lays the foundation for all subsequent life experiences (Seldin, 2018). Rajović (...) also notes that each generation of children is getting worse every year. As many as 50 percent of Slovenian children have difficulties in reading, writing or mathematics, and at the age of six with fine motor skills. Children have problems with eye alignment, with the large areas in the brain that regulate finger use, speech, etc. Each of these brain regions is extremely important for the development of cognitive skills. It puts the responsibility of parents first because they are the ones who should be aware that they are harming their children's development, especially by doing everything for them, by not letting them jump in puddles, by restricting their movements, and by "wrapping them in cotton wool" (Teran Košir, 2019).

This survey gave us an idea of the current mindset of kindergarten professionals. It could be used as a foundation for further development. First and foremost, with the concept of a school for parents before the birth of their child, where they would be informed about all the positive effects of early stimulation; about the mistakes to avoid in parenting, the activities to do, the experiences to offer the child. This work would then continue with kindergarten professionals, providing them with knowledge and examples of NTC activities in the first age period, because only in this way will we contribute to the integral development of each child.

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*Dr. Maja Hmelak, izredna profesorica za pedagogiko na Pedagoški fakulteti Univerze v Mariboru.
E-mail: maja.hmelak@um.si*

*Anita Kirbiš, mag. prof. predšolske vzgoje, zaposlena na OŠ Starše, vrtec Pikapolonica, Marjeta.
E-mail: anita.kirbis2@gmail.com*

Assessment of Early Childhood Teachers' Competencies for Care and Education of Toddlers

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KLJUČNE BESEDE: vrtec, vzgojitelji, kompetence vzgojiteljev, prvo starostno obdobje

POVZETEK – Sodobni trendi institucionalne vzgoje izkazujejo potrebo po specifičnih kompetencah vzgojiteljev, ki delajo v oddelkih prvega starostnega obdobja (gre za oddelke, v katere so vključeni otroci med prvim in tretjim letom starosti). To potrjujejo tudi teoretična spoznanja in praktične izkušnje strokovnjakov, ki se ukvarjajo z vzgojo otrok prvega starostnega obdobja. Cilj te empirične kvalitativne študije z elementi primerjalnega pristopa je raziskati, osvetliti in razumeti perspektivo vzgojiteljev o lastnih kompetencah za delo z otroki tega obdobja v vrtcih v Bosni in Hercegovini in Republiki Sloveniji. Raziskavo smo izvedli v letu 2022. Za zbiranje podatkov smo uporabili na novo kreiran strukturiran spletni intervju v pisni obliki. V raziskavo je bilo vključenih 91 anketirancev. S tematsko analizo vsebine odgovorov anketirancev in teoretične postavitve koncepta kompetenc vzgojiteljev smo identificirali šest kategorij prednosti, povezanih z njihovimi kompetencami, in devet kategorij težav, s katerimi se srečujejo pri svojem delu. Ugotovitve raziskave kažejo, da vzgojitelji lastnih kompetenc ne prepoznajo kot optimalno razvitih.

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KEYWORDS: kindergarten, early childhood teachers' competencies, early childhood education and care

ABSTRACT – Contemporary trends in the education and care of toddlers shed light on the specific competencies of early childhood teachers. The aim of this empirical qualitative study with elements of a comparative approach is to investigate, look at and understand the perspective of early childhood teachers about their own competencies for working in toddler groups in kindergartens in Bosnia and Herzegovina and in the Republic of Slovenia. We collected the data needed for the research in 2022 from 91 respondents using a self-created structured online interview in written form. Through the thematic analysis of the content of respondents' answers and the theoretical setting of the concept of early childhood teachers' competencies, nine categories of difficulties and six categories of advantages related to their competencies were distinguished. The findings of this study point to the fact that early childhood teachers for toddlers do not assess their own competencies as optimally developed.

1 Introduction

Views on the care and education of a young child have gradually but radically changed in the last few generations (Perko et al., 2019). The formation of modern trends in the education and care of toddlers was also influenced by the positive experiences of the Montessori method and the theory of *the unconscious absorbing mind* of a young child (Kordeš Demšar, 2007; Mavrič, 2019; Montessori, 2003), by the theoretical and methodical approach of Pickler's care and education of a toddler (Balesko et al., 2019; Belza et al., 2019; Sagastui et al., 2020), and by Gerber's methodical approach in working with the youngest children (Hammond, 2021). A multidisciplinary approach to the

care and education of toddlers sheds light on the need for highly competent early childhood teachers for toddlers. Based on the established interpretation of early childhood teachers' competencies (Mohamed et al., 2017), a competent kindergarten early childhood teacher for toddlers should possess knowledge, pedagogical and organizational skills; build partner relations with parents, experts and the community; improve professionally; and respect professional ethics. Higher education helps the career development of students (Blažič, 2021), and undergraduate education should have particular importance for the development of early childhood teachers' competencies (Barenthien et al., 2020). The quantitative research results by Šindić et al. (2022) directly link theoretical knowledge and information with the successful implementation of educational work in kindergarten. Retar and Lepičnik Vodopivec (2017) indicate that professional development does not take place only within formal education but throughout life, within professional learning communities (Labak et al., 2022), while the results of research conducted by Barenthien et al. (2020), Partalo et al. (2022), Sucuoglu et al. (2014), Šindić and Pribišev Beleslin (2018) confirm the connection between practice and experience with early childhood teachers' competencies.

We approached the research based on the knowledge that the toddler period is specific and extremely important in human development, and that the competencies of early childhood teachers for toddlers are still an under-researched area. We were interested, from the point of view of early childhood teachers, to see and understand the preparation and training for the specifics of work in toddlers' groups. We set ourselves the following research questions: What competencies do early childhood teachers recognize as essential for working in a toddlers' group, and how do they assess them in themselves (representation and method of acquisition)?

2 Method

The aim of this empirical qualitative study with elements of a comparative approach (Merriam and Tisdell, 2015) is to investigate, look at and understand the perspective of early childhood teachers about their own competencies for working in toddlers' groups in kindergartens in Bosnia and Herzegovina and in the Republic of Slovenia. We collected the data needed for the research through an online survey (Hooley et al., 2012) using a structured online interview in written form. For data analysis, a thematic analysis of the content of respondents' answers was used (Viligi, 2016), taking into account the theoretical foundation of early childhood teachers' competencies (Mohamed et al., 2017) and the typology of five areas of key competencies of early childhood teachers (Erčulj et al., 2008).

Participants

Ninety-one respondents (90 women and one man) participated in the research. The participants were early childhood teachers and early childhood teachers' assistants employed in kindergartens in Bosnia and Herzegovina (Republic of Srpska) (Nb = 51) and

in the Republic of Slovenia (Ns = 40). For the purposes of the research, it is important to emphasize that 83 early childhood teachers who have completed undergraduate education for early childhood teachers (from BiH Nb = 51, and from the Republic of Slovenia Ns = 32) and early childhood teachers' assistants (Nspv = 8) who have completed high school participated in the research. The average age of participants from BiH is 33 (M = 33.21; SD = 6.62; Min = 25; Max = 50), and from Slovenia 40.5 (M = 40.51; SD = 9.8; Min = 24; Max = 57). The average age of all participants is 36.42, with the youngest participant being 24 years old and the oldest 57. Participants from Bosnia and Herzegovina have worked in kindergarten for 6 years on average (M = 5.84; SD = 4.7; Min = 0.5; Max = 26), 3 years of which in nurseries (M = 2.71; SD = 3.57; Min = 0.5; Max = 17). Participants from Slovenia have an average of 14 years of work experience in kindergarten (M = 13.68; SD = 9.73; Min = 1; Max = 39), 4 years of which in nurseries (M = 4.49; SD = 3.21; Min = 0.5; Max = 12). Participants from both countries worked in nurseries for an average of 3.5 years (M = 3.49; Min = 0.5; Max = 17). Of the interviewees from BiH, 9 of them (17.65%) work in the younger toddler group (from 1 to 2 years old); 4 (7.84%) in the older toddler group (from 2 to 3 years old); 26 (50.98%) in the mixed toddler group; 12 (23.53%) do not currently work in the toddler group. Of the interviewed participants from Slovenia, 16 (40%) work in a group of children aged 1 to 2 years; 11 (27.5%) work in a group of children aged 2 to 3 years; 13 (32.5%) work in a mixed toddler group.

Data collection and analysis

We collected the data needed for the research in 2022 through a structured online interview that we had constructed ourselves. The instrument was made in two versions, in Serbian and Slovenian. It consists of two parts. In the first part, through 9 items, demographic and other basic data on the participants were collected. In the second part, through 6 open-type items, we tried to collect data on the experience of early childhood teachers working in the toddler group and a self-assessment of their own competencies. Although written interviewing lacks interaction between the researcher and the respondent, this research technique enables the participation of those participants who find face-to-face interviews uncomfortable and show resistance (Morris, 2015); it also reduces other problems encountered in live interviews (Hooley et al., 2012).

In order to check the validity and reliability of the instrument, we conducted a pilot study in Banja Luka, BiH, with 10 participants. Through the thematic analysis of the answers, we observed the potential of the instrument to inductively build theories of local character through insights and reflections, starting from micro data towards a broader conceptual understanding, which is one of the indicators of the validity and reliability of the research instrument (Merriam and Tisdell, 2015; Morse et al., 2002).

After the pilot study, the research was carried out with all participants in both countries. During the research, the code of ethics was respected. The participants were informed that the data they provide will be used exclusively for scientific purposes, and they entered the interview voluntarily with respect for anonymity.

Data analysis is inductive and comparative. The content analysis of participants' answers was carried out with the help of the QCAmap program (Mayring, 2022). It

contained qualitative steps in which categories were assigned to the original statements of participants and quantitative steps in which the frequency of categories was analyzed. Two authors alternately checked the consistency of the categories and the overall analysis process.

3 Findings and discussion

Starting from the definition of the competencies of early childhood teachers (Mohamed et al., 2017) and the distribution of key competencies of early childhood teachers (Erčulj et al., 2008), the categories we had formed on the basis of participants' answers to open-type questions were joined to the appropriate competencies, their frequencies were determined (Table 1), and compared between countries. Depending on the nature of the category, it is associated with one or possibly two competencies. Counting the answers belonging to different categories, it was determined that 161 statements refer to the assessment of difficulties in working with toddlers related to the underdevelopment of competencies, and 196 statements refer to advantages related to the development of competencies. Nine categories indicating difficulties (Table 3) and six categories indicating advantages in working with toddlers (Table 2) were singled out. These findings indicate that the examined early childhood teachers are not considered to be optimally competent. The results of the study by Lipscomb et al. (2022) with fifty early childhood teachers employed in nurseries indicate that the perception of the early childhood teachers' own abilities to work with small children is associated with increased stress; the need for professional support that would enable early childhood teachers to assess themselves as more competent has been observed.

Early childhood teachers from Bosnia and Herzegovina pay special attention to the competence of effective teaching and working with children (Table 1). Namely, seven recognized categories correspond to this competence and the emphasized frequency of responses associated with these categories.

Five separate categories correspond to the competence of communication and relationships. Based on the representation of those five categories in the preschool teachers' answers, it can be seen that early childhood teachers pay slightly less attention to the competence of communication and relationships than to effective teaching and working with children.

Table 1

Competencies of Early Childhood Teachers with Associated Categories

	<i>Competencies</i>		<i>Associated categories</i>	<i>Category Representation</i>
1.	Effective teaching and working with children	1.	Easier work compared to that in kindergarten groups (easier adaptation, simpler organization of activities, smaller number of children in the group, easier influence/direction of children)	40 %
		2.	Quickly visible results due to susceptibility to the influence of age	32 %
		3.	Difficulties with health care and safety of children	31 %
		4.	The problem of choosing and adapting activities	29 %
		5.	Unpreparedness and lack of training for working with children at an early age	20 %
		6.	Adaptation as a difficulty	16 %
		7.	Problems during inclusion	8 %
2.	Communication and relationships	1.	Cooperation and help of other early childhood teachers	69 %
		2.	Relationship warmth and affection	36 %
		3.	Cooperation and assistance of the professional service	34 %
		4.	Cooperation with parents as a difficulty	25 %
		5.	Misunderstanding of children due to age	9 %
3.	Organization and management	1.	The diversity and size of the group as a difficulty	37 %
		2.	Insufficient equipment	8 %
4.	Professional development	1.	Quickly visible results due to susceptibility to the influence of age	32 %
		2.	Novelties and curiosities	4 %
5.	Cooperation with the working and social environment	1.	Cooperation and help of other early childhood teachers	69 %
		2.	Cooperation and assistance of the professional service	34 %
		3.	Cooperation with parents as a difficulty	25 %

The competence of cooperation with the working and social environment stands out as the third most represented, with three separate categories.

The other two recognized competencies are professional development, and organization and management.

Table 2*Advantages and Benefits of Working with Toddlers*

<i>Types of competencies</i>	<i>Categories</i>	<i>BiH</i>		<i>Slovenia</i>		<i>BiH and Slovenia together</i>	
		<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
Effective teaching and working with children	Easier work compared to work in kindergarten groups (easier adaptation, simpler organization of activities, smaller number of children in the group, easier influence/direction of children)	19	37.25	17	42.5	36	39.56
	Quickly visible results due to susceptibility to the influence of age	11	21.57	18	45	29	31.87
Professional development	Novelties and curiosities			4	10	4	4,4
Communication and relationships	Cooperation and help from other early childhood teachers	32	62	31	77.5	63	69
	The warmth of relationships and attachment to children/of children	24	47.05	9	22.5	33	36.26
	Cooperation and assistance of the professional service	12	23.53	19	47.5	31	34
Cooperation with the working environment	Cooperation and help from other early childhood teachers	32	62	31	77.5	63	69
	Cooperation and assistance of the professional service	12	23.53	19	47.5	31	34

The most represented categories that indicate ease in working with toddlers are the cooperation and help of other early childhood teachers (statements of 69 % of participants) and the cooperation and help of the professional service (statements of 34 % of participants), which fall under the competencies of *cooperation with the working environment*, and *communication and relationships*. These findings indicate the exceptional importance of professional learning communities for the development of competencies, as indicated by the findings of the research by Labak et al. (2022). Moreover, in another study, Mohamed, Valcke, and Ve Wever (2017) point to the importance of mutual cooperation among early childhood teachers through the exchange of knowledge and experience for the development of their competencies.

The advantages of working with toddlers are also recognized when it comes to *communication and building relationships with children*. More than a third of the participants (36.26%) single out as an advantage the emphasized warmth of the relationship and attachment to the toddlers/of toddlers (47.05 % of the interviewed early childhood

teachers from Bosnia and Herzegovina and 22.05% of the early childhood teachers from Slovenia). Moreover, in the quantitative evaluation of care and education in the Republic of Slovenia (Erčulj et al., 2008), early childhood teachers highly rated their own competence *I express a positive attitude towards the child*. Contemporary research indicates that the relationship, attachment and cooperation with toddlers develop spontaneously through various contacts while changing clothes (Belasko et al., 2019), feeding (Belza et al., 2019), physical touch, putting them to sleep, responding to the toddler's cry.

Early childhood teachers associate the advantages of working with toddlers with the competence of *effective teaching and working with children*. More than a third of participants (39%) declare that it is easier for them to implement care, educational work and teaching in the toddler group than with children of kindergarten age. They notice that younger children adapt more easily, the organization of activities is simpler, and it is easier to influence and direct younger children. The results of working with children are quickly visible due to children's susceptibility to influence (the category based on the statements of 31.87% of participants). This contributes to more successful teaching and work with toddlers, and makes it easier for the teacher to assess their competencies and to further develop and improve them.

Novelties and interesting things are an integral part of professional training and *professional development*, and represent the competence recognized as an advantage for working with toddlers (the statements observed in the answers of 4.4% of participants). The development of science and positive practice contributes to the need for professional training through lifelong learning, which has a positive effect on the development of competencies, as indicated by the results of research on educational practice in Slovenia (Retar & Lepičnik Vodopivec, 2017).

Early childhood teachers have the most difficulties with the competence of *effective teaching and working with toddlers* (Table 3). Almost one-third of the participants (30.77%) point to inadequate health care and reduced safety of children, which is directly reflected in the work in nurseries. Early childhood teachers from Bosnia and Herzegovina single out this problem in particular (41.18%). The results of the SWOT analysis carried out in 2019 in Bosnia and Herzegovina also support these findings. They indicate the same problems, and the need for personnel such as pediatric nurses, pediatricians, isolation rooms, etc. (Šindić, 2019). The problem of unpreparedness and lack of training for working with toddlers was recognized by a third of early childhood teachers from Bosnia and Herzegovina (33.33%), which is in line with the findings of other categories presented in the rest of this research (Table 4 and Table 5). The Slovenian participants are somewhat better prepared for working in toddler groups, but they also cite numerous obstacles to effective teaching and working with children. They mostly point to the problem of adaptation (20%), selection and adjustment of activities, as well as the health care and safety of children (17.5%). In order for the early childhood teacher to be successful, it is necessary to choose and adjust activities in accordance with the developmental needs and capabilities of the children, ensure health care, and adequately respond to the children's needs, as indicated by the results of numerous studies on working with the youngest (Belasko et al., 2019; Belza et al., 2019; Sagastui et al., 2020). Less than 8% of all participants declare that they have a problem with the inclusion of children with difficulties in the toddler group. The results of quantitative

research conducted with early childhood teachers in Slovenia (Erčulj et al., 2008) indicate the need for additional improvement in the competence of *recognizing children with special needs and adapting work in accordance with their needs*. Drlić (2021) observes that the legislation in the Republic of Slovenia is changing with the aim of supporting the inclusion of preschool children, which certainly facilitates the integration of children with difficulties into the regular program of preschool institutions.

Table 3

Difficulties in Working with Toddlers (Need to Improve Competencies)

Type of competencies	Category	BiH		Slovenia		BiH and Slovenia together	
		F	%	f	%	f	%
Effective teaching and working with children	Difficulties with health care and safety of children	21	41.18	7	17.5	28	30.77
	Unpreparedness and lack of training for working with toddlers	17	33.33	1	2.5	18	19.78
	The problem of choosing and adapting activities	11	8	7	17.5	18	19.78
	Adaptation as a difficulty	7	5	8	20	15	16.48
	Problems during inclusion	5	9.8	2	5	7	7.69
Organization and management	The diversity and size of the group as a difficulty	27	52.94	7	17.5	34	37.36
	Insufficient equipment	3	5.88	4	10	7	7.69
Cooperation with the social environment/ Communication and relationships	Cooperation with parents as a difficulty	9	17.65	14	35	23	25.27
Communication and relationships	Misunderstanding of children due to age	6	11.76	2	5	8	8.79

Early childhood teachers find the biggest obstacle to the development of *organizational and management* competencies in the number of children in the groups and the mixed age group (37.36%), with early childhood teachers from BiH leading the way, namely 52.94% of them. Similar results were found in research conducted in Bosnia and Herzegovina, where early childhood teachers cite the number of children in the group as one of the significant obstacles to optimal work in nurseries (Šindić, 2019). The problem of insufficient equipment was also observed (a category that was recognized in the answers of 7.69% of participants).

The lack of competence in cooperation with *the social environment, and in communication and relationships* is primarily recognized by participants in cooperation with parents, namely 25.27% of them (35% of participants from Slovenia, and 17.65% of participants from Bosnia and Herzegovina).

While for the competence of *relationships and communication with toddlers*, more than a third of participants see advantages in the warmth of relationships and attachment to children/of the children; a smaller number of participants (8.79%) identify a problem in communication due to the misunderstanding of children on account of the age specificity. The statements of participants from Bosnia and Herzegovina (11.76%) are more numerous than the statements of Slovenian participants (5%). Based on these insights, it could be said that early childhood teachers from Bosnia and Herzegovina focus more attention on analyzing the competence of communication and relations with toddlers from both a positive and a negative angle. The results of the study by Lipscomb et al. (2022) indicate that difficulties in building relationships with small children are additionally influenced by stress related to this specific type of work.

Table 4

Self-Assessment of the Early Childhood Teacher's Readiness to Work in the Nursery (Adequately Developed Competencies)

Category	BiH		Slovenia		BiH and Slovenia together	
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
The importance of previous experience for the development of competencies	5	9.8	6	15	11	12.09
Early childhood teachers have no difficulties working in the toddler group	5	9.8	8	20	13	14.29

Based on the early childhood teachers' self-assessment of their readiness to work in nurseries, 12.09% of them (9.8% of early childhood teachers from BiH and 15% of early childhood teachers from Slovenia) indicate the importance of previous professional experience (Table 4). The results of other research on kindergarten practice carried out in different countries (BiH, Germany and Turkey) link the professional experience of early childhood teachers and the development of competencies (Barenthien et al., 2020; Partalo et al., 2022; Sucuoglu et al., 2014; Šindić and Pribišev Beleslin, 2019).

From the answers of the early childhood teachers, a category was singled out from which it is evident that a smaller number of early childhood teachers (14% of all interviewed early childhood teachers; 9.8% of early childhood teachers from Bosnia and Herzegovina, 20% of early childhood teachers from Slovenia) estimate that their readiness and competencies for working in nurseries are at an optimal level and that they have no difficulties during care and educational work (Table 4).

We classified the data on the preparation of early childhood teachers for working with toddlers during undergraduate studies into four subcategories (Table 5). We had at our disposal the answers of 83 participants who had graduated from the university. While two-thirds of participants from Bosnia and Herzegovina (66.67%) stated that the faculty had prepared them little or not at all for work in nurseries, especially concerning baby care, slightly less than two-thirds of participants from Slovenia (62.5%) stated

that the faculty prepared them well or moderately for work in nurseries. The results of the SWOT analysis carried out in BiH in 2019 also indicate a weaker preparation of undergraduate students for working with children up to three years of age compared to the preparation for working with children from three to six years of age (Šindić, 2019).

Table 5

Preparation for Work in the Toddler Group during Undergraduate Studies

	Subcategory	BiH		Slovenia		BiH and Slovenia together	
		<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
Preparation during undergraduate studies for work in nurseries	Good	11	21.57	10	31.25	21	25.30
	Moderate	6	11.76	10	31.25	16	19.28
	Little	26	50.98	9	28.13	35	42.17
	None at all	8	15.69	3	9.38	11	13.25

Research findings indicate the need to modernize undergraduate studies for early childhood teachers in BiH with new content and/or courses to prepare future early childhood teachers for care and educational work with children up to three years of age. Although the situation is somewhat better in Slovenia, these findings are still far from ideal because 37.51% of the participants stated that their undergraduate studies had prepared them little or not at all for working in nurseries. That is why these findings could be relevant to modernizing the undergraduate study program for early childhood teachers with content related to the care and education of children up to three years of age in Slovenia.

4 Conclusion

The findings of this study point to the fact that early childhood teachers for toddlers do not assess their own competencies as optimally developed, nor do they consider themselves sufficiently qualified for work. Nine categories of difficulties and six categories of advantages and benefits related to their competencies were singled out. It can be seen that early childhood teachers give priority to the competencies of *effective teaching and working with children, and communication and relationships*, while the most developed competency is cooperation with the working environment which indicates the importance of professional learning communities. There is a need to enrich and modernize the undergraduate study program for early childhood teachers with contents related primarily to care, but also to the education of children up to three years of age in Bosnia and Herzegovina and the Republic of Slovenia, and a need for a greater emphasis on professional training. These are also topics that further research could open up. The limitation of the study is that it is based only on the self-assessment of early childhood teachers, which reduces its objectivity.

Mag. Tanja Glišić, dr. Aleksandra Šindić, dr. Jurka Lepičnik Vodopivec

Ocenjevanje kompetenc vzgojiteljev za vzgojo otrok prvega starostnega obdobja

Posebnost zgodnjega otroštva zahteva poseben pristop k vzgoji majhnih otrok. Na oblikovanje sodobnih trendov v vzgoji otrok prvega starostnega obdobja so vplivali teoretični in metodološki pristopi Montessori (Kordeš Demšar, 2007; Mavrič, 2019; Montessori, 2003), Piklerov pristop (Balesko idr., 2019; Belza idr., 2019; Sagastui idr., 2020) in Gerberov pristop (Hammond, 2021). Multidisciplinarni pogled na vzgojo otrok prvega starostnega obdobja kaže na potrebo po visoko razvitih kompetencah vzgojiteljev in vzgojiteljic. Pri opredelitvi kompetenc smo se naslonili na študijo Erčulj in drugi (2008). Izhajajoč iz teh spoznanj mora imeti kompetenten vzgojitelj razvite naslednje kompetence: komunikacija in odnosi, učinkovito poučevanje, organizacija in vodenje, sodelovanje z delovnim in družbenim okoljem in profesionalni razvoj. Ob tem pa se mora strokovno izpopolnjevati in spoštovati poklicno etiko (Erčulj idr., 2008; Mohamed, Valcke in Ve Wever, 2017). Želeli smo raziskati in razumeti dožemanje vzgojiteljev in vzgojiteljic o lastnih kompetencah, potrebnih pri delu z otroki prvega starostnega obdobja.

Zastavili smo si raziskovalno vprašanje: Katere kompetence vzgojiteljev prepoznajo kot bistvene za delo v skupini otrok prvega starostnega obdobja in kako jih ocenjujejo glede na razvitost in način pridobivanja?

Cilj te empirične kvalitativne študije z elementi primerjalnega pristopa (Merriam in Tisdell, 2015) je raziskati, pogledati in razumeti perspektivo vzgojiteljev o lastnih kompetencah za delo z otroki prvega starostnega obdobja v vrtcih v Bosni in Hercegovini in Republiki Sloveniji. V raziskavo je bilo vključenih 91 anketirancev, in sicer vzgojiteljev s končano dodiplomsko izobrazbo za vzgojitelja ($N_v = 83$) in pomočnika vzgojitelja s končano srednjo šolo ($N_{pv} = 8$). Večina anketiranih je žensk (90 žensk in en moški). Anketiranci so zaposleni v vrtcih v Bosni in Hercegovini (Republika Srbska) ($N_b = 51$) in Republiki Sloveniji ($N_s = 40$). Najmlajši anketiranec je star 24 let, najstarejši pa 57 let, povprečna starost anketirancev je 36,5 let. Anketiranci so z otroki v skupinah otrok prvega starostnega obdobja delali povprečno 3,5 leta (anketiranci iz Bosne in Hercegovine 3 leta, anketiranci iz Slovenije pa 4 leta). Za zbiranje podatkov o izkušnjah vzgojiteljev in njihovi samooceni lastnih kompetenc smo uporabili strukturiran spletni intervju v pisni različici s skupno 15 vprašanji. Prvi del intervjuja je vseboval devet vprašanj za zbiranje demografskih in drugih osnovnih podatkov o anketirancih. Drugi del s šestimi odprtimi vprašanji je bil namenjen zbiranju podatkov o izkušnjah vzgojiteljev pri delu z otroki prvega starostnega obdobja in samooceni lastnih kompetenc.

S pilotno raziskavo (predraziskavo) z 10 anketiranci v Bosni in Hercegovini smo pridobili podatke, ki so nam omogočili določitev nekaterih elementov veljavnosti in zanesljivosti raziskovalnega instrumenta (Merriam in Tisdell, 2015; Morse idr., 2002). Podatke, pomembne za raziskavo, smo zbrali leta 2022 s spoštovanjem etičnega kodeksa, prostovoljnosti in anonimnosti anketirancev.

Za analizo podatkov je bila uporabljena tematska analiza vsebine odgovorov anketirancev (Viligi, 2016) glede na teoretično postavko o kompetencah vzgojiteljev in njihovih tipologijah (Erčulj, idr., 2008; Mohamed, Valcke in Ve Wever, 2017).

Iz odgovorov vzgojiteljev pri delu z otroki prvega starostnega obdobja je razvidno, da imajo vzgojitelji bolj razvite kompetence učinkovitega poučevanja in dela z otroki ter komunikacije in odnosov, najbolj razvita kompetenca pa je sodelovanje z delovnim okoljem, kar kaže na pomen strokovnih učnih skupnosti.

Ugotovitve te raziskave kažejo, da vzgojitelji svojih kompetenc pri delu z otroki prvega starostnega obdobja ne ocenjujejo kot optimalno razvitih.

161 izjav anketiranih se nanaša na oceno težav pri delu z otroki v vrtcu, povezanih z nerazvitostjo kompetenc, 196 izjav pa na prednosti, povezane z razvitostjo kompetenc. Lipscomb idr. (2022) v svoji raziskavi z vzgojitelji, ki delajo v vrtcu, navajajo, da je zaznavanje lastnih sposobnosti vzgojiteljev za delo z majhnimi otroki povezano s povečanim stresom. Na podlagi ugotovitev avtorji (prav tam) izpostavljajo potrebo po strokovni podpori, ki bi vzgojiteljem omogočila, da se ocenijo kot bolj kompetentne.

Kategorije, ki kažejo na težave, so: težave z zdravstveno skrbjo in varnostjo otrok (trditve zastopa 30,77% anketiranih); nepripravljenost in neusposobljenost za delo z otroki v zgodnjem otroštvu (trditve zastopa 19,78% anketiranih); problem izbire in prilagajanja dejavnosti (trditve zastopa 19,78% anketiranih); težave med vključitvijo (trditve zastopa 7,69% anketiranih); prilagajanje kot težava (trditve zastopa 16,48% anketiranih); kombiniranost in številčnost skupine kot težava (trditve zastopa 37,36% anketiranih); nezadostna opremljenost (trditve zastopa 7,69% anketiranih); sodelovanje s starši kot težava (navedbe zastopa 25,27% anketiranih); nerazumevanje otrok zaradi njihove starosti (trditve zastopa 8,79% anketiranih).

Da bi bil vzgojitelj uspešen, je treba izbirati in prilagajati dejavnosti v skladu z razvojnimi potrebami in zmožnostmi otrok, skrbeti za zdravje in se ustrezno odzivati na potrebe otrok, na kar kažejo rezultati številnih raziskav na področju dela z najmlajšimi. Raziskovalni rezultati Belasko idr. (2019), Belza idr. (2019), Perko idr. (2018) in Sagastui idr. (2020) poudarjajo, da je za uspešnost vzgojitelja treba izbirati in prilagajati dejavnosti glede na razvojne potrebe in zmožnosti otrok, skrbeti za zdravje in se ustrezno odzivati na potrebe otrok, kar je 30,77% anketirancev v tej raziskavi označilo za težavo. Rezultati kvantitativne raziskave, opravljene z vzgojitelji predšolskih otrok v Sloveniji (Erčulj idr. 2008), kažejo na potrebo po dodatnem izboljšanju kompetence prepoznavanja otrok s posebnimi potrebami in prilagajanja dela njihovim potrebam, kar je v korelaciji z našimi ugotovitvami. Drljič (2021) ugotavlja, da se zakonodaja v Republiki Sloveniji spreminja z namenom podpore vključevanju predšolskih otrok, kar naj bi vzgojiteljem zagotovo olajšalo vključevanje otrok s težavami v redni program vrtcev. Nekateri avtorji opažajo potrebo po senzibilizaciji zaposlenih v vrtcih o povečani ranljivosti staršev otrok prvega starostnega obdobja, njihovih potrebah po poudarjeni socialni in zdravstveni oskrbi ter po pedagoški in svetovalni podpori pri navajanju na starševstvo, kar bi prispevalo h krepitvi kompetenc vzgojiteljev za sodelovanje s starši otrok prvega starostnega obdobja. Perko, Cugmas in Pšunder (2019) ugotavljajo, da je pomembno, da odrasli razumejo majhnega otroka in njegove razvojne potrebe, da prepoznajo in razumejo njegove težave in strahove ter se znajo nanje ustrezno odzvati, kar bi zagotovo prispevalo k boljši komunikaciji in odnosu odrasel–otrok. Rezultati študije Lipscomb idr. (2022) navajajo, da na težave pri vzpostavljanju odnosov z majhnimi otroki dodatno vpliva stres, povezan s to specifično vrsto dela.

Najbolj zastopane kategorije, ki kažejo na lahkotnost pri delu z otroki prvega starostnega obdobja, so: sodelovanje in pomoč drugih vzgojiteljev (trditve zastopa 69 % anketirancev) ter sodelovanje in pomoč strokovne službe (navedbe zastopa 34 % anketirancev). Te ugotovitve kažejo na pomen poklicnih učnih skupnosti za razvoj kompetenc, na kar kažejo ugotovitve raziskave Labak idr. (2022). Tudi v drugi študiji Mohamed, Valcke in Ve Wever (2017) poudarjajo pomen medsebojnega sodelovanja skozi izmenjavo znanja in izkušenj za razvoj njihovih kompetenc.

Kategorije, ki nakazujejo prednosti dela z otroki prvega starostnega obdobja, so: lažje delo v primerjavi z delom z otroki drugega starostnega obdobja (to je z otroki med tretjim in šestim letom starosti), (lažje prilagajanje, enostavnejša organizacija dejavnosti, manjše število otrok v skupini, lažje vplivanje/usmerjanje otrok) (navedbe 39 % anketirancev); hitro vidni rezultati zaradi dovednosti za vpliv starosti (trditve zastopa 31,87 % anketirancev); novosti in zanimivosti (trditve zastopa 4,4 % anketirancev); toplina odnosa in navezanost otrok/na otroke (trditve zastopa 36,26 % anketirancev).

Razvoj znanosti prispeva k potrebi po strokovnem usposabljanju skozi vseživljenjsko učenje, kar pozitivno vpliva na razvoj kompetenc, na kar kažejo rezultati raziskave izobraževalne prakse v Sloveniji (Retar in Lepičnik Vodopivec, 2017), ki je skladna z našimi ugotovitvami.

Podobno kot v naši raziskavi in v kvantitativnem vrednotenju vzgoje in izobraževanja v Republiki Sloveniji (Erčulj idr., 2008) so vzgojitelji visoko ocenili lastno usposobljenost, s čimer izražajo pozitiven odnos do otroka. Raziskave kažejo, da se odnos, navezanost in sodelovanje z otroki razvijajo spontano skozi različne stike med preoblačenjem (Belasco idr., 2019), hranjenjem (Belza idr., 2019), fizičnim dotikom, uspavanjem in odzivom na otrokov jok. Raziskava Sagastui idr. (2020) nakazuje specifičnost odnosa in komunikacije z otroki prvega starostnega obdobja v kontekstu proste igre za podporo avtonomije in samoodločanja.

Na podlagi samoocene vzgojiteljev o pripravljenosti za delo z otroki prvega starostnega obdobja jih 12,09 % navaja pomen predhodnih poklicnih izkušenj. Podobne ugotovitve najdemo tudi v raziskavah v Bosni in Hercegovini, Nemčiji in Turčiji (Barenthien idr., 2020; Partalo idr., 2022; Sucuoglu idr., 2014; Šindić in Pribišev Beleslin, 2019).

Dve tretjini anketirancev iz Bosne in Hercegovine (66,67 %) in več kot tretjina anketirancev iz Slovenije (37,51 %) je navedlo, da jih je dodiplomski študij malo ali sploh nič pripravil na delo z otroki prvega starostnega obdobja. Tudi rezultati SWOT analize, izvedene v Bosni in Hercegovini leta 2019, kažejo na slabšo pripravljenost dodiplomskih študentov za delo z otroki do treh let v primerjavi s pripravljenostjo za delo z otroki od treh do šestih let (Šindić, 2019).

Najbolj zastopana kompetenca je učinkovito poučevanje in delo z otroki ter komunikacija in odnosi, najbolj razvita kompetenca pa sodelovanje z delom v okolju, kar kaže na pomen strokovnih učnih skupnosti.

Pomembna ugotovitev našega dela je potreba po obogatitvi in posodobitvi dodiplomskega študijskega programa za vzgojitelje z vsebinami, ki se nanašajo na vzgojo, predvsem na vzgojo otrok do tretjega leta starosti v obeh državah. Izsledki raziskave kažejo na potrebo po dodatnem strokovnem izpopolnjevanju na tem področju. V nadaljnjih raziskavah bi se bilo smiselno bolj ukvarjati s temi problemi, ki odpirajo nova

raziskovalna vprašanja. Omejitev študije je, da temelji le na samooceni vzgojiteljev, kar zmanjšuje objektivnost dobljenih rezultatov.

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Tanja Glišić, MA, senior teaching assistant/lecturer in the field of educational methodology at Faculty of Philosophy, University of Banja Luka.

E-mail: tanja.glisic@ff.unibl.org

Aleksandra Šindić, PhD, full professor of methodics of educational work at the study programme for preschool education, Faculty of Philosophy, University of Banja Luka.

E-mail: aleksandra.sindic-radac@ff.unibl.org

Jurka Lepičnik Vodopivec, PhD, full professor for preschool pedagogy and scientific adviser at the Faculty of Education, University of Primorska, Koper, Slovenia.

E-mail: jurka.lepicnik@pef.upr.si

Slikopis kot pripomoček za razvijanje multimodalne pismenosti

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KLJUČNE BESEDE: slikopis, vsebinske in oblikovne značilnosti, multimodalna pismenost, bralna pismenost, vizualna pismenost

POVZETEK – Slikopisi so ob slikanicah eden prvih multimodalnih sestavov, s katerimi se srečajo že najmlajši otroci. Znana je njihova didaktična vloga v procesu opismenjevanja, manj pa je slikopis poznan in uporabljen kot pripomoček za razvijanje multimodalne pismenosti. Multimodalna pismenost bralcu omogoča, da razbere pomene iz različnih kodov sporočanja in ustvari skupni pomen. V raziskavo smo zajeli 24 izvirnih slovenskih slikopisov, izdanih med leti 2018 in 2022. Raziskovali smo vsebinske in oblikovne značilnosti slikopisov in ugotavljali položaj sličic v slikopisu. Analiza slikopisov je razkrila, da gre za izjemno bogato obliko multimodalnega sestava, ki vsebuje kakovostna informativna ali leposlovna besedila, manjše sličice v različnih funkcijah (dopolnitev, zamenjava ...) in v nekaterih primerih tudi ilustracije različnih velikosti (npr. ilustracija zavzema manjši del strani ali pa kar celo stran). Večina slikopisov ima uporabljene velike tiskane črke, kar je pričakovano s stališča prepoznavanja črk in postopnega opismenjevanja.

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KEYWORDS: rebus stories, contextual and design characteristics, multimodal literacy, reading literacy, visual literacy

ABSTRACT – Rebus stories are, beside picture books, one of the first multimodal ensembles that children encounter at a very young age. Their didactic role in the process of acquiring literacy skills is well known, but rebus stories are less known and less often used as an aid in developing multimodal literacy. Multimodal literacy enables the reader to decipher the meanings from various communication modes and create a joint meaning. The study included 24 original Slovene rebus stories published between 2018 and 2022. We investigated the content and design characteristics of rebus stories and the position of images in the rebus story. An analysis of rebus stories revealed that they are an extremely rich form of multimodal ensembles that include quality informative or literary texts, small images in various functions (supplementing, replacing, etc.) and in some cases also illustrations of various sizes (e.g., the illustration takes up a small section of the page or even the entire page). Most rebus stories used capital letters which is to be expected from the aspect of local practices in teaching children letter recognition and gradual acquisition of literacy skills.

1 Uvod

Ljudje se sporazumevamo z različnimi kodi sporočanja, pri čemer je treba poudariti, da raziskovalci niso enotni v tem, kateri pojavi bi morali imeti status koda (modalitete). Temeljna opredelitev multimodalnosti izhaja iz strukturalne lingvistike (de Saussure) ter semiotike kot splošne vede o znakih (Barthes) in je kot taka del filozofske spoznavne teorije in filozofije jezika (Haramija in Batič, 2020). Teoretična izhodišča o multimodalnosti (Kress in van Leeuwe, 2001; Serafini, 2014; Jewitt 2008) ne ponudijo enotne opredelitve, pri čemer pa je vendarle skupna točka teoretičnih izhodišč o multimodalnih tiskanih besedilih opredeljena kot celota besedila, vizualne podobe (fotografije, risbe, slike, grafi, tabele) in oblikovanja (robovi, tipografija, drugi grafični elementi). Multi-

modalno branje zahteva od bralca sestavljanje pomenov besedila z upoštevanjem vseh kodov sporočanja, ki jih neko tiskano gradivo vsebuje. Najenostavnejša multimodalna besedila imajo dva koda sporočanja, to sta verbalni in vizualni kod, redkeje je dodan še zvočni kod. Multimodalni sestavi so v sodobnem svetu prisotni v fizičnem okolju (revije, časopisi, učbeniki, ilustrirane knjige, oglasni panoji ipd.) in na spletu (spletne strani, socialna omrežja), slednji pa temelji na multimodalnosti. Z uporabo tehnologije, npr. mobilnih telefonov, je skoraj vsak posameznik ves čas v stiku z neko obliko multimodalnega sestava (npr. si ogleduje videoposnetke, komentira objave z besedami in emotikoni, oblikuje multimodalne sestave, kot so fotografije z besedilom ali videoposnetke) (Stanković in Blažič, 2017). Pri tem je potrebno opozoriti, da so mladostniki do tovrstnih naprav "pogosto premalo kritični, zato je pomembno, da jih ozaveščamo s pomenom varne in odgovorne uporabe le-teh" (Cvek in Pšunder, 2019, str. 19).

Če trdimo, da "med osnovno znanje in veščine pismenosti spada branje, razumevanje ter tvorjenje informacij" (Sadar in Erjavec, 2021, str. 93), se je potrebno vprašati, kakšna besedila v sodobnem času zares beremo. S pojavom multimodalnih gradiv ali sestavov bi se namreč morala sistematično razvijati tudi multimodalna pismenost, ki bi bralcu omogočila, da razbere pomene iz različnih kodov sporočanja in ustvari skupni pomen. Vendar je tudi pri branju izrazito multimodalnih sestavov, kot je npr. slikanica, pozornost odraslega bralca usmerjena v verbalni kod sporočanja, od koder zajema informacije, in manj v vizualni kod sporočanja. Raziskava, v katero so bili vključeni študenti predšolske vzgoje, je razkrila, da so študentje "iz podanega multimodalnega dela svoje ugotovitve utemeljevali predvsem iz besedila" (Bednjički Rošar in Batič, 2022, str. 119).

Najpogostejši multimodalni sestav, s pomočjo katerega otrok vstopa v svet tiskanih gradiv, je slikanica (Pečjak, 2009). "V predšolskem in zgodnje šolskem obdobju zapisana, govorjena in vizualizirana besedila predstavljajo odraščajočim pomemben stik z umetnostnim jezikom" (Mejak in Udovič Medved, 2019, str. 4). Slikanica vsebuje oblikovni in vsebinski odnos med besedilom in ilustracijo, ki pomembno vpliva na razbiranje sporočila (Nodelman, 1996; Nikolajeva, 2003; Sipe, 1998). Podobno je tudi pri slikopisu, ki je prav tako multimodalni sestav, pri čemer imajo slikopisi izrazito spoznavno funkcijo, zlasti na škodo estetske, deloma pa tudi etične funkcije besedila, kakor jih utemeljuje Kos (2001).

Kljub temu da je slikopis multimodalno besedilo, je njegovo branje izrazito linearno. Prav zato je branje slikopisa najmanj zahteven način branja multimodalnega besedila in s tem usvajanja veščin bralne pismenosti. Tovrstno branje lahko uvrstimo v prvo fazo bralnega razvoja v ožjem pomenu, to je v logografsko ali slikovno fazo (Pečjak in Gradišar 2015), v kateri otrok zaznava besede kot slike, hkrati pa so slike v slikopisu prepoznaven vzorec, ki mu pomaga pri razvijanju razumevanja pomena besedila. Otrok s pomočjo slikopisov ne usvaja le veščin bralne pismenosti, ampak tudi multimodalne in vizualne pismenosti. Vizualna pismenost se nanaša na sposobnost branja in interpretiranja slikovnega gradiva in je eden od pogojev za multimodalno pismenost, kadar je v multimodalnem sestavu prisoten vizualni kod sporočanja (Serafini, 2014; Haramija in Batič, 2016).

Zaradi svoje didaktične naravnosti se slikopisi načeloma sploh ne obravnavajo v okviru literarnoteoretičnih razprav o slikanicah, temveč v okviru didaktike jezika in književnosti (prim. opozarjanja na večkodnost v učnem načrtu Slovenščina, 2018), pre-

učevanja učbeniških gradiv za različne predmete (prim. Starc, 2009) in opismenjevanja s pomočjo večkodnih sporočil oz. spoznavanja sestavljenih sporočil, kamor sodijo tudi slikopisi (prim. Grosman, 2009).

2 Metodologija

Namen raziskave in raziskovalna vprašanja

Namen raziskave je proučiti in definirati značilnosti kakovostnih slovenskih slikopisov. V raziskavi smo si zastavili raziskovalni vprašanji:

- ☐ Kakšne so vsebinske in oblikovne značilnosti izvirnih slovenskih slikopisov?
- ☐ Kakšna je uporaba sličic v slikopisih?

Potek zbiranja slikopisov in analiza gradiva

V raziskavo smo zajeli slikopise, ki so bili izdani v knjižni obliki v zadnjih petih letih (med leti 2018 in 2022). S ključno besedo slikopis ob upoštevanju knjižnih izdaj zadnjih petih let ter hkratnem upoštevanju filtrov ciljna skupina otroci in slovenski jezik in vrsta vsebine (in slikanica in kratka proza in pravljica in poezija in razne literarne vrste) in tiskano gradivo, smo dobili 45 enot gradiva. Med dobljenimi 45 zadetki je bilo ročno pregledano celotno gradivo, zaradi ponatisov (letnice ponatisov so dodane v tabeli) ali neustreznosti izhodiščnih pogojev (prevodi, nedostopnost) je bilo izločenih še 21 slikopisov. Raziskava je torej obsegala 24 izvirnih slovenskih slikopisov, izdanih med leti 2018 in 2022; pripravljen je bil izpis dobljenih rezultatov z ukazom izvoz podatkov. Ker so za raziskavo dobljeni viri temeljnega pomena, so ti navedeni v popisu literature.

Gradivo smo analizirali z vidika vsebinskih značilnosti (književna vrsta in tema) in oblikovnih značilnosti (zgradba in število besed ter prisotnost vizualnih podob oz. sličic). Ugotovitve smo predstavili v tabelah.

3 Rezultati in interpretacija

Pri vsebinskih značilnostih lahko ugotovimo, da sodijo besedila, izdana v slikopisni obliki, v različne tipe informativnih in leposlovnih besedil. V analizi smo identificirali en informativni slikopis, ki sodi na področje naravoslovja (tabela 1), in 23 leposlovnih slikopisov, ki so v spodnjih tabelah predstavljeni po književnih zvrsteh: različne literarne vrste (tabela 2), poezija (tabela 3), proza (tabele z oznako 4a, 4b, 4c, 4d, 4e).

Tabela 1*Informativni slikopis*

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Doria, Julija: Žužkopis: slikopis z žuželkami, 2019	Informativni slikopis: pomen žuželk za ohranitev planeta. Besedišče je stvarno, besedilo opominja na raznolikost biotskih vrst in njihovo koristnost za Zemljo. Navedena so nenavadna poimenovanja nekaterih živali (npr. alpski kozliček je hrošč, ivanjska ptičica je metulj); delitev na nočne in dnevne živali; nekatere zanimive lastnosti (prim. gosenica, govnač).	☐ Ena tematska pripoved skozi celotno slikanico, ☐ na dvojnih straneh: ena stran celostranska ilustracija, ki se navezuje na zgodbo, na drugi strani slikopis, ☐ velike tiskane črke, ☐ približno 300 besed, ☐ 34 sličic (poimenovane so v dodanem slovarčku na dnu posamezne slikopisne strani). Večinoma so s sličicami zamenjane živali (npr. čebele, metulji, mravlje ...). V slikopisu je približno 12 % sličic.

Tabela 2*Leposlovni slikopis, različne literarne vrste*

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Štefan, Anja in Jelka Reichman: Lešniki, lešniki, 2018, 2020, 2021, 2022 (prva izdaja 2000 in več izdaj)	Vsebuje 19 poglavij, ki sodijo v različne književne zvrsti (poezija, proza – pravljice, živalske pravljice, kratka realistična zgodba). Poglavja so dolga 1 ali največ 2 strani. Ob koncu besedila, v katerem so posamezne besede nadomeščene s sličicami, se v nekaterih poglavjih pojavijo ilustracije, ki ne nadomeščajo besedila, ampak ga na nek način dopolnijo (npr. cvetoči travnik na koncu poglavja, naslovljenega Čmrlj in piščalka).	☐ Velike tiskane črke, spominja na ročno pisavo, ☐ po barvi in velikosti izstopajo prve črke v povedih, ☐ naslovi posameznih poglavij so sestavljeni iz naslova in ilustracije (kot dopolnitev), npr. poglavje Polžek, sličice in besedila (dopolnitev), npr. Račke in ribnik (račke so samo upodobljene), samo sličice (npr. Petelini); v kazalu so naslovi izpisani z besedami, ☐ posamezen slikopis ima med 50 in 100 besed, v povprečju je s sličicami zamenjanih okrog 25 % besed.

Tabela 3*Poezija*

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Remškar, Slavica in Anka Kočever: Leti, leti, leti ..., 2019	V slikopis je zbranih 10 pesmi. Veliko sličic je na koncu verzov in tvorijo rimo (npr. v Pustni pesmici: grof, krof, potica, kraljica).	☐ Velike tiskane črke, ☐ vsaka pesem se razteza čez dve strani, ☐ v nekaterih je zelo malo zamenjanih besed (npr. Leti, leti, leti ... nebo! ima le 4 sličice in skupaj 70 besed), to je 6 % sličic, v pesmi Bere, bere ... pa je s sličicami zamenjanih 11 besed (37 besed, od tega se jih 5 ponovi v sličici in besedi), kar je skoraj 30 % sličic.

Med 21 proznimi slikopisi smo identificirali 2 slikopisa, ki sodita med pripovedke (tabela 4a), 9 slikopisov s pravljicami (tabela 4b), 7 je kratkih fantastičnih zgodb (tabela 4c), 2 slikopisa, ki sodita med realistične kratke zgodbe (tabela 4d), in eno delo, ki vsebuje tudi nekaj slikopisov s šalami (tabela 4e).

Tabela 4a*Proza (pripovedke)*

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Ban, Tatjana: Volčja Draga: [slikopis], 2019	Pripovedka je pojasnilo o imenu Volčja Draga. Dodana je spremna beseda Igorja Saksida.	☐ Ena zgodba, ☐ na dvojnih straneh: ilustracije zgoraj ali spodaj, tudi čez dve strani, v prazen prostor umeščen slikopis, ☐ približno 300 besed, ☐ zelo malo besed je nadomeščenih s sličicami; dodan je slovarček, sličice niso logične.
Grafenauer, Niko in Ajda Erznožnik: Kekec in Pehta, 2022, 2020 (prva izdaja 2012)	Bistveno skrajšana Vandotova povest. Niko Grafenauer je na enak način po Vandotovi zgodbi o Kekcu že priredil tudi delo Kekec in Prisank (2012 in več izdaj).	☐ Ena zgodba, ki je razdeljena na 31 poglavij (vsako poglavje je na dveh straneh: slikopis + dodana ilustracija); sledijo naloge za opismenjevanje, ki jih je sestavila Eva Grafenauer Korošec, ☐ informacije so podvojene: sličica + beseda, ki je uokvirjena (izstopajoča); približno 20 sličic na poglavje; ☐ posamezna zgodba ima v povprečju okrog 120 besed; to je približno 17 % podvojenih informacij.

Tabela 4b*Proza (pravljice)*

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Ban, Tatjana: Kresnička: pravljica v sličicah, 2018	Živalska pravljica o Kresnički, ki bi bila rada koristna, a nihče noče, da bi mu svetila. Naposled sreča murna, ki je vesel njene luči. Rodi se ljubezen.	☐ Ena zgodba, ☐ na dvojnih straneh: ena stran celostranska ilustracija, ki se navezuje na zgodbo, na drugi strani slikopis, ☐ velike tiskane črke, ☐ približno 350 besed, ☐ 40 sličic, to je približno 11 % sličic, ☐ sličice so poimenovane v dodanem slovarčku ob koncu knjige, ☐ sličice niso logično prepoznavne, gre za nevsakdanje besede.
Ban, Tatjana: Mravljčinček Edi: slikopis, 2018	Živalska pravljica o Ediju kot umetniku, njegove pesmi niso napisane kot slikopis, temveč so navedene kot navadno besedilo.	☐ Ena zgodba, ☐ na dvojnih straneh: ena stran celostranska ilustracija, ki se navezuje na zgodbo, na drugi strani slikopis, ☐ približno 350 besed, ☐ 40 sličic, to je približno 11 % sličic, ☐ sličice so poimenovane v dodanem slovarčku ob koncu knjige, ☐ sličice niso logično prepoznavne, gre za nevsakdanje besede.
Ban, Tatjana: Sladica je potica: [slikopis], 2019	Živalska pravljica o Taščici Rubi, ki lepo poje; povabijo jo, da bi zapela na koncertu. Tema zgodbe je njena trema, ki pa ji jo pomaga kljukica za perilo odpraviti (reče ji, naj misli na slastno potico, ko bo pela). Dodani sta dve pesmi, vabilo in zahvala.	☐ Ena zgodba, ☐ na dvojnih straneh: ena stran celostranska ilustracija, ki se navezuje na zgodbo, na drugi strani slikopis, ☐ približno 350 besed, ☐ 40 sličic, to je približno 11 % sličic, ☐ sličice so poimenovane v dodanem slovarčku ob koncu knjige, ☐ sličice niso logično prepoznavne, gre za nevsakdanje besede.

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Doria, Živa Viviana: Deževen dan v gozdu: slikopis, 20018	Živalska pravljica; nekateri živali imajo raje dež kot druge (npr. zajec uživa ob skakanju po lužah, miš pove pregovor, da po dežju vedno posije sonce).	☐ Ena zgodba, ☐ velike tiskane črke, ☐ dvojna stran vsebuje do 50 besed (skupaj okrog 400 besed) in celostransko pripadajočo ilustracijo, ☐ pod besedilom je rubrika opis slik, kjer je nanizan slikovni slovarček (46 ilustracij), dodana je beseda za posamezno sliko (gozd, zajec, škorenjčki, luža ...), ☐ v slovarčku se ponavljajo iste besede (prim. gozd), ☐ z ilustracijami je zamenjanih približno 12 % različnih besed.
Bonte, Mojiceja in Tina Perko: Teci, miška!, 2019, 2020, 2021	Živalska pravljica; miška se odpravi iz luknjice in vidi v svetu marsikaj zanimivega. Mama jo krega, ko se miška vrne, saj se zaveda, da je bila mala miš v nevarnosti.	☐ Ena zgodba, ☐ velike tiskane črke, ☐ slikopis je napisan v slovenščini, v tistem delu, kjer so sličice, je pod sličico zapis v angleščini, ☐ slovar: slika iz besedila ter angleška in slovenska beseda, ☐ gre za spoznavanje temeljnega besedišča – otrok lahko poimenuje sličico v slovenščini ali posamezne besede v angleščini.
Doria, Živa Viviana: Zimski dan: slikopis, 2019	Poosebljena lisica se sprehaja po zasneženem gozdu, v brlogu pije čaj, nato se gre sankat s čisto novimi sanmi. Ker je sankanje bolj zabavno v dvoje, želi povabiti medveda, a ta jo odpodi, saj se že pripravlja na zimsko spanje. Lisica povabi na zimske radosti zajca, skupaj preživita lep zimski dan.	☐ Ena zgodba, ☐ velike tiskane črke, ☐ dvojna stran vsebuje do 35 besed (skupaj okrog 300 besed) in celostransko pripadajočo ilustracijo, ☐ pod besedilom je rubrika opis slik, kjer je nanizan slikovni slovarček (44 ilustracij), dodana je beseda za posamezno sliko (lisica, medved, brlog, veje, sonce, budilka ...), ☐ v slovarčku se ponavljajo iste besede (lisica, zajec, sani, snežak); z ilustracijami je zamenjanih približno 15 % besed.

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Doria, Živa Viviana: Narval in sinji kit: slikopis, 2022	Narval je plaval proti sinjemu kitu. Našteto je, koga vse je srečal na poti (beluge, morski klobuki, trava, kiti), kita je našel na rojstni dan. Pove mu, kako rad ima zvezde; kit si izbere eno, da bosta mislila drug na drugega, ko bosta vsak na svojem koncu sveta. Poanta o zvezdah malce spominja na Malega princa.	☐ Ena zgodba, ☐ velike tiskane črke, ☐ dvojna stran vsebuje okrog 40 besed (skupaj okrog 400 besed) in dvostransko pripadajočo ilustracijo; ☐ slikopis je umeščen pod ilustracijo (dve do tri vrstice besedila na vsaki strani), ☐ sličice, ki zamenjajo besede, niso pojasnjene oz. poimenovane z besedo, nekatere sličice so enoznačne (zvezde, čas, Zemlja ...), druge pa lahko mladega bralca spravijo v dvom (ali so mišljene ledene gore, kdo je Narval), ☐ zamenjane sličice se ponavljajo (npr. zvezde, Narval); ☐ s sličicami je zamenjanih 48 besed, to je približno 12 % besed.
Grafenauer Korošec, Eva in Daša Simčič: Kdo je napravil Vidku srajčico, 2020	Primerjava izhodiščnega besedila Frana Levstika (ki je tudi naveden kot avtor) in priredbe v slikopis pokaže, da je zgodba ista, deloma je posodobljeno besedišče; slikopis ima podnaslove.	☐ Velike tiskane črke, ☐ ena zgodba, razdeljena na 16 delov, ki so naslovljeni (vsak del se razteza čez dvojno stran), ☐ posamezni del je sestavljen iz dvostranske ilustracije, ki se navezuje na naslov ter slikopisa, ☐ podvajanje informacij – ilustracija in izpostavljena beseda (zapisana v pravokotniku) sta nosilki iste informacije, npr. ilustracija Vidka + zapis VIDEK, ☐ zelo veliko besed in ilustracij se podvoji, okrog 25 %.
Kraljič, Helena in Polona Kosec: Muca Mija in prijatelji: v slikopisu, 2022	Štiri zaokrožene zgodbe, v katerih je glavni literarni lik muca Mija (Muca Mija in miška Maška, Muca Mija in čudežna rastlina, Muca Mija in rojstni dan, Muca Mija in novoletno darilo). Vse štiri zgodbe so predhodno izšle kot slikanice (2017), gre torej za avtoričine priredbe lastnih zgodb v slikopise.	☐ Štiri zgodbe, ki so različno dolge (naslovna stran posamezne zgodbe + prva obsega 6 dvojnih strani, druga 3 dvojne strani, tretja 4 in četrta 5 dvojnih strani + končno stran), ☐ velike tiskane črke, ☐ tipična dvojna stran je sestavljena iz slikopisa, ene večje ilustracije (ključni dogodek ali prikaz prostora), na obarvani podlagi na vseh listih v spodnjem delu pa je slovarček z naslovom Besede k slikam, kjer je k posamezni sličici dodana beseda, ☐ razmerje med številom besed in ilustracij je pri vseh štirih zgodbah približno enako (npr. tipična dvojna stran vsebuje 9 do 12 sličic, skupaj okrog 70 besed; končne strani eno do štiri sličice), to je v povprečju približno 12 % sličic.

Tabela 4c*Proza (kratke fantastične zgodbe)*

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Doria, Živa Viviana: Rdeča ladja: sliko- pis, 2019	Slikopis predstavlja poosebljeno ladjo (v bistvu gre za jadnico), ki pluje po morju, si ogleduje živali v morju, ko pa se vreme poslabša, poskuša ladja čim prej priti v varno пристanišče.	☐ Ena zgodba, ☐ velike tiskane črke, ☐ dvojna stran vsebuje do 40 besed (skupaj okrog 350 besed) in celostransko pripadajočo ilustracijo, ☐ pod besedilom je rubrika opis slik, kjer je nanizani slikovni slovarček (44 ilustracij), dodana je beseda za posamezno sliko (ladja, jadra, valovi, galebi ...), ☐ v slovarčku se ponavljajo iste besede (npr. ladja, valovi, sidro) ☐ z ilustracijami je zamenjanih približno 13 % besed.
Kraljič, Jaka in Bojan Sum- rak: Vozila v slikopisu: [dve zgodbi], 2022	Dve zgodbi, vsaka zase je zaokrožena celota, in sicer Traktor Janez in Avtomobil Čarli. V prvi traktor povabi druga vozila (avtomobil, gasilski avto, bager, tovornjak) na rojstnodnevno zabavo. Druga govori o tem, kako se avto počuti nekoristnega v primerjavi z drugimi tremi vozili, a se na koncu izkaže za zelo koristnega, ko odpelje lastnika bagra k zdravniku.	☐ Prva zgodba je dolga 12, druga 10 strani; ☐ velike tiskane črke; ☐ vozila imajo lastna imena in so poosebljena; ☐ na dnu strani je slovarček, ki pojasnjuje sličice (Besede k slikam), ☐ prva zgodba vsebuje 63 sličic (te se ponavljajo, npr. bager, dom, cesta ...), skupaj okrog 300 besed (približno 20 % sličic), ☐ druga zgodba vsebuje 40 sličic in okrog 250 besed (približno 16 % sličic).
Kremlj, Urša in Stropnik Šonc, Urška: Kdo se boji višine in druge zgodbe v sličicah, 2018, 2019	Zbirka kratkih fantastičnih zgodb; glavni literarni liki so živali, ki so povsem antropomorfne: živijo v prebivališčih, podobnih človeškim, opravljajo človeška dela in poklice, opisana so njihova čustva in vsakdanji dogodki (prim. Težka hiška, Ko te prebudi pomlad).	☐ 11 zgodb, vsaka zgodba je dolga eno stran, ☐ na drugi strani dvojne strani je celostranska ilustracija, ki prikazuje temeljni motiv zgodbe, ☐ posamezna zgodba vsebuje okrog 100 besed, od tega okrog 20 sličic, kar je 20 %, ☐ sličice so tako enostavne (in shematizirane), da slovarček ni potreben (prim. maček, drevo, ptič, gobe, sonce ipd.).

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Krempl, Urša in Stropnik Šonc, Urška: Mehurčki pri- jateljstva, 2020	Zbirka kratkih fantastičnih zgodb; glavni literarni liki so živali, ki so povsem antropomorfne: živijo v prebivališčih, podobnih človeškim, opravljajo človeška dela in poklice, opisana so njihova čustva in vsakdanji dogodki (prim. Na poletni tabor, Čudovit dan v gorah).	☐ 11 zgodb, vsaka zgodba je dolga eno stran, ☐ na drugi strani dvojne strani je celostranska ilustracija, ki prikazuje temeljni motiv zgodbe, ☐ posamezna zgodba vsebuje okrog 100 besed, od tega okrog 20 sličic, kar je 20 %, ☐ sličice so tako enostavne (in shematizirane), da slovarček ni potreben (prim. hrib, sir, miš, avtobus, veter ipd.).
Krempl, Urša in Stropnik Šonc, Urška: Pravljčna noč in druge zgodbe v sličicah, 2022	Zbirka kratkih fantastičnih zgodb; glavni literarni liki so živali, ki so povsem antropomorfne: živijo v prebivališčih, podobnih človeškim, opravljajo človeška dela in poklice, opisana so njihova čustva in vsakdanji dogodki (prim. Sreča za vse, Športni dan).	☐ 11 zgodb, vsaka zgodba je dolga eno stran, ☐ na drugi strani dvojne strani je celostranska ilustracija, ki prikazuje temeljni motiv zgodbe, ☐ posamezna zgodba vsebuje okrog 100 besed, od tega okrog 20 sličic, kar je 20 %, ☐ sličice so tako enostavne (in shematizirane), da slovarček ni potreben (prim. hiša, vrt, lisica, petelin ipd.).
Krempl, Urša in Stropnik Šonc, Urška: Srečen dan in druge zgodbe v sličicah, 2021, 2022	Zbirka kratkih fantastičnih zgodb; glavni literarni liki so živali, ki so povsem antropomorfne: živijo v prebivališčih, podobnih človeškim, opravljajo človeška dela in poklice, opisana so njihova čustva in vsakdanji dogodki (prim. Vroče poletje, Kdo ima rad dež?).	☐ 11 zgodb (vse so natisnjene na eni strani); ☐ na drugi strani dvojne strani je celostranska ilustracija, ki prikazuje temeljni motiv zgodbe, ☐ posamezna zgodba vsebuje okrog 100 besed, od tega okrog 20 sličic, kar je 20 %, ☐ sličice so tako enostavne (in shematizirane), da slovarček ni potreben (prim. medved, zajec, krona, knjiga, luč ipd.).
Remškar, Slavica in Jaka Vukotič: Nande v šoli, 2021	Glavni literarni lik papagaj Nande je govoreči ptič, ki skozi 11 dvostranskih poglavij popestri vsakdanje realistične dogodivščine prvošolcev.	☐ 11 zgodb (vsaka zajema dve strani), ☐ velike tiskane črke, ☐ posamezna zgodba vsebuje okrog 65 besed, od tega 21 sličic, kar je 32 %, ☐ pri nekaterih sličicah so dodane besede (npr. imena likov, samostalniki v množini), ☐ ena od zgodb vsebuje krajše besedilo, ki pojasnjuje posvojitve, ta del je brez sličic in z malimi tiskanimi črkami.

Tabela 4d*Proza (kratke realistične zgodbe)*

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Slakonja, Boštjan in Alenka Kramar: Enia potuje – pri prijateljici Li Juan, 2018	Slikopisna zgodba sodi med kratkoprozne doživljajske zgodbe, deloma vsebuje potopisne značilnosti (družina obišče Kitajsko, hrana, način prehranjevanja), predvsem pa govori o prijateljstvu in sprejemanju različnosti. Enakost je razložena skozi solze.	☐ Velike tiskane črke, ☐ ilustracije so dvostranske ali enostranske (razvijajo zgodbo), pri obeh variantah pa je besedilo le na eni strani, ☐ vsebuje približno 300 besed, od tega jih je 73 nadomeščenih s sličico, kar je približno 25%, ☐ nekatere besede so napisane v sličicah (npr. obris Afrike in napis; sličica deklice in napis Li Juan).
Sokolov, Cvetka in Anka Kočevar: Bilo je nekoč na deželi, 2021	Kratka realistična spominska zgodba (vsebuje 11 dvostranskih poglavij), v katerih babica vnukoma razloži, kako so živeli včasih (npr. kako so bile opremljene učilnice, kako je bila opremljena kuhinja ipd. začetek in konec je v sodobnem svetu, v trenutni sedanjosti, s katero se preteklost primerja. Zgodbe so oblikovno zelo raznolike, in sicer od klasičnega slikopisa, kjer besedo zamenja sličica, do kombinacije sličic, ki dopolnjujejo besedilo z manjšimi ilustracijami.	☐ 11 zgodb (vsaka zajema dve strani), ☐ velike in male tiskane črke (strnjeno besedilo), ☐ manjše sličice, ki se pojavijo kot zamenjava za besedo ali kot dopolnitev (npr. besedilo govori o leseni puščici za svinčnik in ob tem se nahaja upodobitev peresnice), ☐ dodane so manjše ilustracije (največje so segajo čez polovico strani) in služijo prikazovanju prostora in dogajanja, ☐ primer klasičnega slikopisa je zgodba V loncu (125 besed, od tega 19 sličic, kar je 15%), ☐ primer kompleksnega slikopisa je zgodba V veliki sobi (51 besed v velikih tiskanih črkah, od tega je 6 sličic, kar je 12%, tri dodatne ilustracije različnih velikosti in besedilo v malih tiskanih črkah brez zamenjav s sličicami).

Tabela 4e*Proza (šale)*

<i>Avtor besedila in ilustracij, naslov, leto izida</i>	<i>Vsebinske značilnosti: književna vrsta in tema</i>	<i>Oblikovne značilnosti: zgradba in število besed</i>
Cici vici na polici: imenitne šale za Ciciba- nov 75. rojstni dan, 2020	☐ ilustrirala Anka Kočevar: Radovednost, Nevidna krava, Kako z levi? ☐ ilustrirala Ana Košir: Zaljubljena miš ☐ ilustriral Zvonko Čoh: Zebra in lev.	Gre za zbirko raznolikih gradiv, med njimi je tudi nekaj slikopisov. Zanimive so šale, ki jih v drugih slikopisih ne najdemo.

Analiza vsebinskih značilnosti slikopisov je razkrila, da slikopisi spadajo v informativno literaturo (letni časi, vozila, odnosi) ali leposlovje. Nekateri slikopisi vključujejo besedila, ki sodijo v različne književne zvrsti. Od 24 analiziranih slikopisov je kar 21 slikopisov proznih, in sicer lahko besedila razvrstimo med pripovedke, pravljice, kratke fantastične zgodbe in kratke realistične zgodbe. Najobsežnejšo skupino slikopisov glede na književno vrsto predstavljajo pravljice (9 primerov), sledijo kratke fantastične zgodbe (7 primerov), pripovedke (2 primera) in kratka realistična zgodba (1 primer). V enem samem primeru pa se pojavijo tudi šale. V leposlovnih slikopisih opazimo izvirna besedila in priredbe, med slednjimi zlasti kratkoprozna ljudska besedila (pravljice, pripovedke).

Oblikovna analiza proznih slikopisov, ki predstavljajo najobsežnejšo skupino slikopisov, je pokazala, da je v slikopisu, izdanem v knjižni obliki, predstavljena ena zgodba ali več krajših zgodb. V skupini pripovedk gre v obeh primerih za eno zgodbo. V skupini pravljic je samo en slikopis sestavljen iz več zgodb (vsebuje štiri različno dolge zgodbe). V skupini kratkih fantastičnih zgodb je razen enega primera v posameznem slikopisu prisotnih več zgodb.

Pri analizi oblikovnih značilnostih se je pokazalo, da je s sličicami zamenjanih od 10% do 20% besed. Sličice so v kakovostnih slikopisih preproste, a ne stereotipne, likovno jasne in preprosto berljive. V primerih, kjer so s sličicami zamenjane nevsakdanje besede, nastane problem razumevanja slikopisa, saj mladi bralec ne more sestaviti multimodalnega pomena, če ne razume vsebine.

Sličice se najpogosteje pojavljajo v treh različicah:

- ☐ podvojitve (sličica, pod katero se nahaja poimenovanje v manjši pisavi),
- ☐ nadomestitev besede (sličica zamenja besedo v povedi),
- ☐ dopolnitev (sličica dopolni besedo).

Približno v polovici primerov so sličicam dodani tudi slovarčki, in sicer so prisotni v treh pojavnih oblikah:

- ☐ slovarčki ob koncu (običajno so dodani tam, kjer gre za eno zgodbo skozi celoten slikopis),
- ☐ slovarček sličic je dodan na dnu vsake strani,
- ☐ podvajanje sličic in besed skozi celotno besedilo.

Večina slikopisov ima uporabljene velike tiskane črke, kar je s stališča prepoznavanja črk in postopnega opismenjevanja pričakovano. Prav tako prevladujejo neserifne in neležeče pisave, ki olajšajo branje bralcu začetniku. Ob tem lahko ugotovimo, da je v slikopisih pisava posameznih naslovov velikokrat barvna in likovno obogatena (npr. črke, dopolnjene z ilustracijo). Pomembno je izpostaviti, da so tudi v slikopisih pogosto prisotne večje ilustracije, ki se med seboj razlikujejo po velikosti (npr. ilustracija zavzema manjši del strani ali pa kar celo stran). V tem primeru gre dejansko za slikopise, ki so dopolnjeni z ilustracijami, slednje pa je potrebno obravnavati kot del multimodalnega sestava, zaradi česar je treba pri analizi proučevati tudi interakcijo, ki se ustvari med slikopisom in ilustracijo, enako kot bi proučevali odnos med besedilom in ilustracijo v slikanici.

4 Zaključek

Ugotovimo lahko, da slikopisi kot ena od oblik slikanic predstavljajo pomemben del multimodalnih sestavov, ki so namenjeni najmlajšim bralcem. Proučevanje literature razkrije, da obravnava slikopisov z vidika njihove multimodalne narave in v nadaljevanju njihove vloge v procesu razvijanja multimodalne pismenosti ni namenjene posebne ali sploh nobene pozornosti. Zato smo v raziskavi želeli raziskati, kakšni so (kakovostni) slovenski slikopisi z vidika vsebinskih in oblikovnih značilnosti. Rezultati vseh v knjižni varianti izdanih slikopisov v zadnjih petih letih kažejo, da gre za izjemno bogato obliko multimodalnega sestava, ki vsebuje kakovostna informativna ali leposlovna besedila (za slednja je značilna pestrost književnih vrst), manjše sličice v različnih funkcijah (dopolnitev, zamenjava, podvojitev) in v nekaterih primerih tudi večje ilustracije.

V prihodnje bi bilo potrebno bolj poglobljeno raziskati razlike med različnimi multimodalnimi sestavi, ki so namenjeni otrokom. Ob tem bi veljalo izpostaviti medpredmetno povezovanje pri učenju različnih pismenosti in sestavljanju različnih modalitet v nove vsebinske sestave.

Janja Batič, PhD, Dragica Haramija, PhD

Rebus Stories as an Aid in Developing Multimodal Literacy

People communicate through different modes of communication. It should be noted that researchers are not unanimous about which phenomena should have modality status. The basic definition of multimodality comes from structural linguistics (de Saussure) and semiotics as a general science of signs (Barthes); as such, it is part of the philosophical cognitive theory and philosophy of language (Haramija and Batič, 2020). Theoretical bases (Kress and van Leeuwe, 2001; Serafini, 2014; Jewitt, 2008) do not offer a single definition of multimodality but the common point in theoretical principles on multimodal printed texts is that it is defined as the entire text, visual image (photographs, illustrations, images, graphs, tables) and design (margins, typography, other graphic elements). Multimodal reading demands of the reader to compose the meaning of the text by considering all the modes of communication that the printed text contains. The simplest multimodal texts have two modes of communication, i.e., the verbal and visual modes; more rarely there is also an audio mode. In the contemporary world multimodal ensembles are present in our physical environment (magazines, newspapers, textbooks, illustrated books, advertising boards, etc.) and on the Internet (web pages, social networks), which is based on multimodality. Through the use of technology, for example mobile phones, almost every individual is constantly interacting with some form of multimodal composition (e.g., watching videos, commenting on posts with words and emoticons, creating multimodal ensembles – photographs with texts). Here it is necessary to point out that young people are often “not critical enough towards such devices and it is important to make them aware of the importance of safe and responsible usage” (Cvek and Pšunder, 2019, p. 19).

When stating that “the basic knowledge and skills of literacy include reading, comprehending and creating information” (Sadar and Erjavec, 2021, p. 93) it is essential that we ask ourselves what kind of texts we are actually reading in modern times. With the appearance of multimodal ensembles, we should also systematically develop multimodal literacy which would enable the reader to decipher meanings from different modes of communication and create a complete meaning. But even in reading very distinctly multimodal ensembles, such as a picture book, the attention of the adult reader is directed towards the verbal mode of communication from which they draw their information and less towards the visual mode. Research that included nursery school pupils revealed that the children “substantiated their findings from the presented multimodal work mostly with the texts” (Bednjički Rošer and Batič, 2022, p. 119). “Texts written, spoken and visualised in the pre-school or early school period present an important contact with artistic language for the growing child” (Mejak and Udovič Medved, 2019, p. 4). The most important multimodal composition with which a child steps into the world of printed materials is the picture book. Picture books contain a design and content relationship between the texts and the illustration which has an important effect on deciphering the meaning (Nodelman, 1996; Nikolajeva, 2003; Sipe, 1998). Rebus stories are similar in that they are also a multimodal composition, though rebus stories have a distinctly cognitive function to the detriment of the aesthetic and partly also the ethical functions of the text, using the terms defined by Kos (2001).

Even though rebus stories are multimodal texts, their reading is distinctly linear. This is why reading a rebus story is the least demanding way of reading multimodal texts and consequently of acquiring reading literacy skills. This kind of reading can be classified as part of the first phase of reading development in its narrowest sense, i.e., the logographic or pictorial stage (Pečjak and Gradišar, 2015) in which the child recognises words as pictures. At the same time the images in rebus stories are a recognisable pattern that help the child in developing and understanding the meaning of the text. With the help of rebus stories, a child not only acquires the skills of reading literacy but also multimodal and visual literacy. Visual literacy relates to the ability of reading and interpreting visual material and is one of the conditions for multimodal literacy whenever the multimodal composition also includes a visual mode of communication (Serafini, 2014; Haramija and Batič, 2016).

Due to their didactic stance, rebus stories are generally not discussed within the framework of literary-theoretical studies about picture books but as part of the didactics of language and literacy. For example, pointing out the multiple modes of communication in the Curriculum for Slovene Language (2018), studying textbook material for various subjects (e.g., Starc, 2009) and acquiring literacy skills with the aid of multiple modes of communication or recognising composite messages, which also include rebus stories (e.g., Grosman, 2009).

The purpose of the study was to investigate and define the characteristics of quality Slovene rebus stories. In our research we set ourselves the following research questions: What are the content and design characteristics of original Slovene rebus stories, and what is the typical use of images in rebus stories? The study included rebus stories that were published in book form over the last five years (between 2018 and 2022). By searching for the keyword ‘rebus story’ (slikopis) in the COBISS national library information and shared cataloguing system for Slovenia, applying filters (children as the

target group; Slovene language; type of content – picture book, short prose, fairy tale, poetry, various literary genres, and printed material), and limiting the results to the last five years of publication, we were left with 45 units of material. For these 45 items, all the material was examined physically and a further 21 rebus stories were excluded due to factors such as reprints (years of publication are included in a table) or inappropriate basic conditions (translations, inaccessibility). Our contextual and design analysis thus included a total of 24 original Slovene rebus stories published between 2018 and 2022. The material was analysed from the aspects of its content characteristics (literary type and theme) and design characteristics (structure and number of words and the presence of visual images or pictures). The results were presented in tables.

An analysis of the content characteristics of the rebus stories examined revealed that rebus stories can be either a form of informative literature (on seasons, vehicles, relationships) or fiction. Some rebus stories include texts that can be categorised into various literary genres. Of the 24 analysed rebus stories, as many as 21 are prose and their texts can be classified as fables, fairy tales, short fantasy stories or short realistic stories. The most extensive group of rebus stories according to literary genre were fairy tales (9 examples), followed by short fantasy tales (7 examples), fables (2 examples) and short realistic stories (1 example). One single example also included jokes. Fiction rebus stories can be either original texts or adaptations (especially of short folk stories).

The design analysis of the prose rebus stories that represent the most extensive group showed that a rebus story can contain a single story or more short stories. In the group of fables, both cases are single stories. In the group of fairy tales, one rebus story contains four stories of varying lengths. In the group of short fantasy tales, apart from one example, all the rebus stories contain multiple stories.

The analysis of design characteristics revealed that between 10 to 20% of words are replaced with pictures. In quality rebus stories the pictures are simple but not stereotypical, and are artistically clear and easily recognisable. Most often they appear in three types:

- Duplication (a picture with the word in a smaller format below it);
- Replacement (the picture replaces the word in the text);
- Supplementation (the picture supplements the words).

About half of the examples also included a picture dictionary, and these can be present in three different formats:

- A picture dictionary at the end of the text (usually where the rebus story is a single story);
- A picture dictionary at the bottom of each page;
- Duplication of the pictures and words throughout the entire text.

Most rebus stories use capital letters which is to be expected from the aspect of local practices in teaching children letter recognition and gradual acquisition of literacy skills. Sans-serif and non-italic fonts prevail, making reading easier for the novice reader. It can also be noted that in rebus stories the writing of individual titles can often be colourful and artistically embellished (e.g., letters complemented with illustrations).

It is important to point out, however, that rebus stories can often also include larger illustrations, which can vary in size (they can take up half a page or even an entire page). Such cases are essentially rebus stories with additional illustrations which need

to be considered as part of the multimodal composition. In analysing such cases we must look at the interaction that is created between the rebus story and the illustration in the same way we would look at the relationship between the text and the illustration in a picture book.

We can see that rebus stories, together with picture books, represent an important part of multimodal ensembles intended for the youngest readers. A review of the literature, however, reveals that not much, if any, attention is given to discussing rebus stories from the aspect of their multimodal nature and consequently their role in developing multimodal literacy. This was why we wanted our study to investigate what quality Slovene rebus stories are like in terms of their content and design characteristics. Results point to an extremely rich multimodal composition, which contains quality information or fictional texts (with the latter including a variety of literary forms), small images in various functions (supplementation, replacement, etc.), and in some cases also larger illustrations.

In the future it would be necessary to look in greater depth at the different multimodal ensembles aimed at children. We can also notice that among the rebus stories with adapted texts, the most interesting ones in terms of researching multimodal characteristics are the texts that had previously been published as picture books – for example, Kekec in Pehta (Kekec and Pehta), Kdo je napravil Vidku srajčico (Who Made Videk's Shirt).

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Dr. Janja Batič, docentka za specialno didaktiko na Pedagoški fakulteti Univerze v Mariboru.
E-mail: janja.batic@um.si

Dr. Dragica Haramija, redna profesorica za področje slovenska književnost na Pedagoški fakulteti in Filozofski fakulteti Univerze v Mariboru.
E-mail: dragica.haramija@um.si

Znanstvena pismenost učencev tretjega vzgojno-izobraževalnega obdobja

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KLJUČNE BESEDE: znanstvena pismenost, osnovnošolci, interes za naravoslovje, odnos do znanosti in tehnologije

POVZETEK – Z raziskavo smo želeli pridobiti podrobnejši vpogled v znanstveno pismenost osnovnošolcev iz tretjega vzgojno-izobraževalnega obdobja v Sloveniji. V kvantitativni raziskavi smo iz desetih naključno izbranih šol vključili po en oddelek učencev posameznega razreda iz tega obdobja. V raziskavo je bilo vključenih 513 učencev, ki so izpolnjevali anonimni vprašalnik o znanstveni pismenosti. Ugotovljamo, da imajo osnovnošolci v tretjem vzgojno-izobraževalnem obdobju še zelo slabe predstave o delu znanstvenikov. Učenci imajo sicer pozitiven odnos do znanosti v šoli in se zavedajo, da sta znanost in tehnologija pomembni za družbo, vendar večinoma ne želijo postati znanstveniki ali inženirji. Ugotovljeno je bilo, da imajo učenci z višjo zaključno oceno pri naravoslovju oziroma biologiji boljšo predstavo o tem, kaj delajo znanstveniki, imajo višji interes za naravoslovje, imajo boljši odnos do znanosti v šoli in do znanosti in tehnologije v družbi.

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KEYWORDS: scientific literacy, primary school students, interest in science, attitudes towards science and technology

ABSTRACT – In the study we wanted to gain a more detailed insight into the scientific literacy of primary school students in the third educational period in Slovenia. In the quantitative research, from 10 randomly selected schools, we included 1 unit of students from each grade of the third educational period, who filled out an anonymous questionnaire about scientific literacy. A total of 513 students were included in the research. We find that primary school students in the third educational period still have very poor ideas about the work of scientists. Students have a positive attitude towards science at school and are aware that science and technology are important to society, but they mostly do not want to become scientists or engineers. It was found that students who have a higher final grade in science or biology have a better idea of what scientists do, have a higher interest in science, and a better attitude towards science at school and towards science and technology in society.

1 Uvod

V učnih ciljih osnovnošolskih naravoslovnih predmetov se poleg pojmov in dejstev (deklarativno znanje) pojavita še znanje in vedenje o naravi naravoslovja (angl. Nature of science, NOS). Za razvijanje znanstvenega pogleda na svet in znanstvenega mišljenja je pomembno spoznati, kako znanost v celoti deluje. Zato se v šolskem prostoru kot pristop uveljavlja učenje z raziskovanjem (angl. Inquiry-based learning, IBL), ki posnema znanstveno raziskovanje s ciljem razumevanja narave naravoslovja.

V raziskavi PISA 2006 je naravoslovna pismenost opredeljena kot: "Posameznikovo naravoslovno znanje in uporaba tega znanja za prepoznavanje bistvenih vprašanj oziroma problematike, pridobivanje novega znanja, razlaganje naravoslovnih pojavov in izpeljevanje ugotovitev, ki temeljijo na preverjenih dejstvih, povezanih z naravoslovnimi znanostmi; razumevanje značilnosti naravoslovnih znanosti kot oblike človeškega

znanja in raziskovanja; zavedanje o tem, kako naravoslovne znanosti in tehnologija oblikujejo našo snovno, intelektualno in kulturno okolje; pripravljenost za sodelovanje pri naravoslovno-znanstvenih vprašanjih kot razmišljujoč človek” (PISA, 2008, str. 23). Naravoslovna pismenost zaobjema štiri področja: naravoslovni kontekst, naravoslovno znanje, naravoslovne kompetence in odnos do naravoslovja. Naravoslovni kontekst je zmožnost posameznika, da prepozna naravoslovje v življenjskih situacijah. Naravoslovno znanje je poznavanje vseh naravoslovnih znanosti in hkratno razumevanje zakonitosti naravnega sveta, ki se odvija okoli njega. Naravoslovne kompetence se pri posamezniku kažejo v zaznavanju in prepoznavanju naravoslovnih problemov ter spremljajočih se vprašanj, v zmožnosti razlaganja pojavov z znanstvenim jezikom in uporabi pravih podatkov. Odnos do naravoslovja se pokaže s posameznikovim zanimanjem za naravoslovne znanosti in dodatni oz. povečani motivaciji na tem področju (PISA, 2008; Jukić in Miroslavljević, 2019). Naravoslovna pismenost torej ne zajema samo naravoslovnega znanja, pač pa tudi druga znanja, ki so pogoj, da posameznik lahko deluje v družbi, kjer je potrebno reševati probleme, s katerimi se posameznik srečuje na vsakodnevni ravni.

To priložnost daje raziskovalni pouk, ki so ga Blažič in sodelavci (2003) in Ferjanova (2003) definirali kot posebno didaktično strategijo znanstvenega spoznanja, ki v pouk vnaša elemente znanstvenega dela. Pri raziskovalno usmerjenemu pouku je učenec v vlogi aktivnega raziskovalca. Pomen poučevanja z raziskovanjem je moč zaznati tudi v slovenskem vzgojno-izobraževalnem prostoru (Markuš in Čagran, 2017; Markuš in Hus, 2018).

Učenci imajo predvsem težave z doseganjem kompetenc, ki vključujejo raziskovane pristope pri spoznavanju naravoslovnih pojmov, in s šibko razvito sposobnostjo načrtovanja in izvajanja raziskovalnega dela (Glažar in Devetak, 2013). Avtorja še izpostavljata, da je potrebno znotraj naravoslovne pismenosti še posebej razvijati sposobnosti razumevanja vpliva znanosti in razvoja tehnologije na naš vsakdan, razvijati sposobnost identificiranja problemov in uporabo strategij aktivnega vključevanja v reševanje problemov (Glažar in Devetak, 2013).

V zadnjih desetletjih upada trend zanimanja za znanost in to negativno vpliva na želje po znanstveni karieri. Navdihovanje mladih, da se ukvarjajo z znanostjo, je pomemben cilj naravoslovnega izobraževanja. Da bi se učenci seznanili z različnimi naravoslovnimi poklici, se karierno izobraževanje vse pogosteje vključuje v pouk naravoslovnih predmetov (Drymiotou idr., 2021; Kang idr., 2021; Kang in Keinonen, 2018). Kang in sodelavci (2021) ugotavljajo, da učenci, ki so prejeli v šoli več informacij o naravoslovnih poklicih, povečajo zanimanje za znanost in se v večjem številu odločajo za naravoslovni študij in kariero na tem področju.

Naravoslovna pismenost črpa znanja tudi iz ostalih področij pismenosti. Brez dvoma je bralna pismenost nujna, da učenec lahko pozna osnovno izrazoslovje s področja naravoslovja. Enako velja za zbiranje, urejanje in razlaganje podatkov, za kar je potrebna matematična pismenost. Zato se je nemogoče izogniti prekrivanju opredelitve naravoslovne pismenosti z drugimi vrstami pismenosti (Norris in Phillips, 2003). Pomemben del naravoslovne pismenosti je zmožnost uporabe naravoslovnega znanja pri reševanju naravoslovnih problemov in prepoznavanju problemov kot takih. Zato naravoslovno pismen posameznik razume, da vse naravoslovne znanosti oblikujejo okolje,

v katerem živimo. Hkrati pa je sposoben razumeti naravoslovna vprašanja in soodločati pri odločitvah, ki vplivajo nanj (Bačnik idr., 2018; PISA, 2008).

Kot izziv na odzive družbenega in gospodarskega napredka se v naravoslovnem izobraževanju pojavljajo nove težnje po oblikovanju znanstveno pismenih državljanov (NRC, 2012; PISA, 2016; Program osnovna šola naravoslovje. Učni načrt, 2011). Narava znanosti je ključna sestavina znanstvene pismenosti, saj učinkovito razumevanje dokazljivo olajša uporabo znanstvenih spoznanj pri vključevanju posameznika v javno razpravo in obravnavo družboslovnih vprašanj (Lederman idr., 2002). V raziskavi uporabljamo pojem znanstvena pismenost, ki je definirana kot matrika znanj, ki so potrebna, da posameznik razume znanost do te mere, da lahko ta vprašanja samostojno kritično vrednoti v medijih in drugod. Ta opredelitev temelji na premisi, kako in koliko povprečen državljan dejansko prepozna, uporabi in vrednoti znanstvena spoznanja. Tako kot človeku ni treba biti ekonomist, da bi prebral poslovni del časopisa, ali odvetnik, da bi prebral o nerešenem primeru vrhovnega sodišča, ni treba biti znanstvenik, da bi bil znanstveno pismen (Trefil in Hazen, 2010). Uveljavljata se dve široki viziji razvoja znanstvene pismenosti (Roberts, 2007; Roberts in Bybee, 2014): prva se bolj osredotoča na vsebine in prakse v znanosti, ki jih definira sama znanstvena skupnost, druga pa vključuje sodelovanje različnih deležnikov pri krmarjenju in kontekstualizaciji kompleksnih družbenih vprašanj, povezanih z naravoslovnimi pojavi. Obe viziji znanstvene pismenosti imata vlogo pri pouku naravoslovja, vendar je drugo vizijo težje udeležati in morda pogosto ni vključena v učenje in poučevanje naravoslovja (Sadler in Zeidler, 2009).

Izkazovanje zanimanja za naravoslovje, podpora znanstvenemu raziskovanju ter izkazovanju motivacije za odgovorno delovanje, na primer v povezavi z naravnimi viri in okoljem, je pomembna dimenzija opredelitve naravoslovne pismenosti v raziskavi PISA (PISA, 2008). Cilj šolskega naravoslovja ni samo spodbujati zanimanje za predmet, ampak tudi poklicno usmerjanje, da po končanem srednješolskem izobraževanju nadaljujejo pot v naravoslovne poklice v znanosti ter se zanimajo za znanstvena vprašanja v odrasli dobi (DeBoer, 2000). V osnovnošolskem izobraževanju je težnja, da že na razredni stopnji razvijamo učenčev pozitiven odnos do naravoslovja, na kar pa vpliva predvsem učiteljev odnos do naravoslovja in tehnologije (Glažar in Devetak, 2013).

V zadnjih letih je bilo narejenih veliko raziskav o odnosu učečih se do naravoslovja, kjer med drugim ugotavljajo, da težava ni v tem, da naravoslovje ni zanimivo, ampak da so drugi predmeti bolj zanimivi od naravoslovja (PISA, 2008; PISA, 2016; Roberts, 2007; Silver in Rushton, 2008; Simon in Osborne, 2010; TIMSS, 2016; Tytler idr., 2008). Tuje raziskave ugotavljajo, da je ključni vir predstav o delu znanstvenikov in znanstvenih karierah dejansko pridobljen iz medijev in znanstvenih besedil (Fujiwara idr., 2022; Kenneth Jones in Hite, 2020; Lee in Kim, 2018). V raziskavi PISA (PISA, 2016) so slovenski učenci in dijaki dosegli nadpovprečne rezultate v znanju. Meritve odnosno-motivacijskega vidika, ko so merili uživanje v učenju naravoslovja, so slovenske učence postavile na predzadnje mesto med sodelujočimi državami. Do podobnih izsledkov so prišli s TIMSS raziskavo (TIMSS, 2016), ko so se slovenski osmošolci uvrstili na 5. mesto od 39 sodelujočih držav. Kljub odličnemu znanju je raziskava pokazala, da imajo nizka stališča do znanja v primerjavi z vrstniki iz drugih držav. V primerjavi z letom 2011 se učenci še manj radi učijo naravoslovje, so manj samozavesti in ocenjujejo poučevanje manj zavzeto kot v drugih državah.

Namen in cilj raziskave

Glavni cilj raziskave je pridobiti vpogled v znanstveno pismenost slovenskih osnovnošolcev v tretjem vzgojno-izobraževalnem obdobju. V učnih ciljih osnovnošolskih naravoslovnih predmetov se poleg pojmov in dejstev (deklarativno znanje) izpostavlja védenje o znanstveni pismenosti, ki ga lahko učinkovito razvijamo z učenjem z raziskovanjem (Newton idr., 2004; Pavlin idr., 2021). Sodobne smernice pouka naravoslovja v osnovni šoli usmerjajo slovenske učitelje, da pri realizaciji učnih ciljev razvijajo tudi znanstveno pismenost. Izpostavljeno je, da naj učenci pri pouku naravoslovja spoznavajo pomen naravoslovnih znanosti za napredek človeštva ter oblikujejo pozitiven odnos in stališča do sebe, okolja in narave. Z razvijanjem in urjenjem eksperimentalno-raziskovalnih veščin in spretnosti ter s spoznavanjem metodologije raziskovalnega dela učenci pridobivajo praktična znanja o naravoslovnih znanostih, ki jih uporabijo pri prepoznavanju in reševanju problemov, s čimer razvijajo kompleksno in kritično mišljenje ter inovativnost in ustvarjalnost (Program osnovna šola biologija. Učni načrt, 2011; Program osnovna šola fizika. Učni načrt, 2011; Program osnovna šola kemija. Učni načrt, 2011; Program osnovna šola naravoslovje. Učni načrt, 2011). Raziskave so pokazale, da morajo učitelji za učinkovito poučevanje znanstvene pismenosti te vidike eksplicitno izpostavljati pri pouku. Učitelji bi morali učencem omogočiti, da razmislijo in razložijo svoje ideje o znanstveni pismenosti, da o njih razpravljajo ter ocenijo skladnost svojih idej z idejami drugih (Schwartz in Lederman, 2002).

Raziskovalna vprašanja

Na osnovi raziskovalnega problema in cilja raziskave smo si zastavili naslednja raziskovalna vprašanja (RV):

- ☐ RV 1: Kakšne predstave imajo učenci o delu znanstvenikov?
- ☐ RV 2: Kakšen je odnos učencev do raziskovalnega dela v šoli?
- ☐ RV 3: Kakšne predstave imajo učenci o pomenu znanosti v družbi?

2 Metoda in raziskovalni pristop

Raziskava je temeljila na kvalitativnem in kvantitativnem pristopu pedagoškega raziskovanja. Uporabili smo deskriptivno in kavzalno-neeksperimentalno metodo raziskovanja.

Vzorec

V raziskavi je zbiranje podatkov potekalo z anketo. Vključili smo naključno izbrani vzorec desetih osnovnih šol v Sloveniji. Iz vsake šole smo vključili vsaj en oddelek učencev posameznega razreda tretjega vzgojno-izobraževalnega obdobja. Anketo je izpolnilo 536 učencev. 23 anket ni bilo v celoti izpolnjenih in smo jih izločili iz raziska-

ve. 513 anket je bilo izpolnjenih v celoti. Anketo je izpolnilo 170 učencev 7. razreda, 145 učencev 8. razreda in 198 učencev 9. razreda.

Postopek zbiranja podatkov

Na šolo smo poslali povezavo do elektronskega vprašalnika in navodila za učitelja, ki je izvajal anketo na šoli. Po pridobitvi dovoljenj staršev za sodelovanje učencev v raziskavi so učenci izpolnili anonimni vprašalnik o znanstveni pismenosti, v katerega smo vključili tudi izbrana demografska vprašanja. Vpogled v učenčeve predstave o znanstveni pismenosti smo pridobili s prilagojeno različico vprašalnika raziskovalcev Silver in Rushton (2008) in Kang s sodelavci (2021). Predstave učencev o pomenu znanosti v družbi ter njihovem odnosu do raziskovalnega dela v šoli smo ugotavljali s trditvami na 7-stopenjski lestvici stališč Likertovega tipa (1 – sploh mi ni všeč, 2 – ni mi všeč, 3 – do neke mere mi ni všeč, 4 – neodločen, 5 – do neke mere mi je všeč, 6 – všeč mi je, 7 – zelo mi je všeč). Interes za naravoslovje (Kang idr., 2021) smo merili s 4-stopenjsko lestvico Likertovega tipa (1 – zelo se ne strinjam, 2 – se ne strinjam, 3 – se strinjam, 4 – se zelo strinjam).

Postopki obdelave podatkov

Pridobljene podatke smo vnesli v program Microsoft Excel. Nato smo s programom SPSS izvedli deskriptivno in inferenčno analizo. Na deskriptivni ravni smo uporabili frekvenčno porazdelitev in osnovno deskriptivno statistiko numeričnih spremenljivk (aritmetična sredina, mediana in standardni odklon). Na inferenčni ravni smo izračunali Pearsonov koeficient korelacije in ANOVO s post hoc testom (Tukey test). Rezultate smo predstavili opisno, shematsko in tabelarično. Podrobnosti o kategorizaciji odgovorov učencev na odprto vprašanje so podane v rezultatih.

3 Rezultati

Z raziskavo smo želeli ugotoviti povezanost med učenčevo zaključno oceno iz naravoslovja in biologije v preteklem šolskem letu, njegovimi predstavami o delu znanstvenika, njegovim odnosom do znanosti v šoli in znanosti v družbi, interesom za naravoslovje ter razredom, ki ga obiskujejo učenci.

Predstave o delu znanstvenika

Učence smo zaprosili, da odgovorijo na vprašanje “Kaj delajo znanstveniki?” Njihovi odgovori so bili kodirani v tri kategorije (preglednica 1). Uporabljene kategorije so bile enake kot v raziskavi Kenneth Jones in Hite (2020). Pri vzorcu 513 učencev smo uspešno kategorizirali 674 predstav učencev. V prvo kategorijo, poimenovano po-

notranjanje ciljev, je bilo zajetih 87,8% vseh predstav o delu znanstvenika. Učenci v odgovoru največkrat izpostavijo, da znanstvenik raziskuje. Druga kategorija je zajemala področja znanosti in tehnologije. V tej kategoriji je bilo zajetih 11,7% vseh predstav o delu znanstvenika. V tretjo kategorijo, imenovano delovno okolje in oprema, je bilo zajetih 0,4% vseh zaznav.

Tabela 1

Kategorizacija odgovorov na vprašanje "Kaj delajo znanstveniki?"

<i>Kategorije</i>	<i>F</i>	<i>f%</i>
<i>Ponotranjenje ciljev</i>		
Ustvarja	10	1,9
Odkriva, rešuje	44	8,6
Eksperimentira	29	5,7
Opazuje	2	0,4
Raziskuje	475	92,6
Deluje znanstveno	32	6,2
Drugo	0	0
Skupaj	592	87,8
<i>Področja znanosti in tehnologije</i>		
Paleontologija	3	0,6
Astronomija	2	0,4
Biologija	48	9,4
Kemija	7	1,4
Računalništvo in informatika	0	0
Inženirstvo	0	0
Fizika	0	0
Geografija	8	1,6
Medicina	1	0,2
Farmacija	3	0,6
Naravoslovje	5	1,0
Drugo	2	0,4
Skupaj	79	11,7
<i>Delovno okolje in oprema</i>		
Laboratorij	1	0,2
Oprema	1	0,2
Teren	0	0
Drugo	1	0,2
Skupaj	3	0,4
Skupaj vse kategorije	674	100

Odnos do znanosti v šoli

Preglednica 2 prikazuje odgovore na trditve, ki se nanašajo na odnos učencev do znanosti v šoli. Zajema 11 trditev, ki so jih učenci ovrednotili na 7-stopenjski Likertovi lestvici. Vrednosti aritmetičnih sredin (M), ki so višje od 4, smo upoštevali kot večinsko pozitivno stališče, vrednosti, ki so nižje od 4, pa kot večinsko negativno stališče. Učenci 7., 8. in 9. razreda so izrazili pozitivno stališče pri desetih trditvah ($M = 5,85\text{--}4,48$) in negativno stališče do ene trditve ($M = 3,75$). Največ, kar 74 % učencev, se je strinjalo s trditvijo, da jim je pri raziskovalnem delu (zelo) všeč delo s sošolci ($M = 5,85$, $SD = 1,54$). Najmanj jim je všeč pisanje poročil o poskusu ($M = 3,75$, $SD = 1,80$).

Tabela 2

Porazdelitev vzorca glede na strinjanje učencev s posamezno trditvijo, ki se nanaša na odnos do znanosti v šoli.

Trditve	Strinjanje učencev s trditvami, ki se nanašajo na odnos do znanosti v šoli.										
		1	2	3	4	5	6	7	M	Me	SD
Opazovanje učitelja pri izvedbi poskusa.	f f%	31 6,0	12 2,3	16 3,1	30 5,8	90 17,5	191 37,2	143 27,9	5,50	6,00	1,61
Samostojno opravljanje poskusa.	f f%	23 4,5	20 3,9	19 3,7	34 6,6	80 15,6	154 30,0	183 35,7	5,58	6,00	1,64
Načrtovanje lastnega poskusa za preizkušanje ideje.	f f%	40 7,8	44 8,6	54 10,5	90 17,5	116 22,6	104 20,3	65 12,7	4,50	5,00	1,76
Sledenje navodilom za izvedbo poskusa.	f f%	32 6,2	17 3,3	36 7,0	94 18,3	141 27,5	134 26,1	59 11,5	4,82	5,00	1,57
Ugotavljanje, zakaj poskus deluje.	f f%	54 10,5	35 6,8	49 9,6	75 14,6	133 25,9	108 21,1	59 11,5	4,48	5,00	1,80
Poročanje o poskusu.	f f%	78 15,2	80 15,6	64 12,5	76 14,8	124 24,2	67 13,1	24 4,7	3,75	4,00	1,80
Samostojno delo.	f f%	45 8,8	37 7,2	46 9,0	58 11,3	118 23,0	123 24,0	86 16,8	4,72	5,00	1,83
Delo s sošolci.	f f%	21 4,1	12 2,3	12 2,3	28 5,5	60 11,7	152 29,6	228 44,4	5,85	6,00	1,54
Načrtovanje nečesa (npr. robota, avtomobila, hiše).	f f%	40 7,8	42 8,2	37 7,2	78 15,2	110 21,4	118 23,0	88 17,2	4,72	5,00	1,81
Izdelovanje modela, ki se ne premika.	f f%	39 7,6	30 5,8	53 10,3	90 17,5	123 24,0	121 23,6	57 11,1	4,60	5,00	1,69
Izdelovanje modela, ki se premika.	f f%	35 6,8	20 3,9	32 6,2	72 14,0	79 15,4	132 25,7	143 27,9	5,16	6,00	1,78

Odnos do znanosti in tehnologije v družbi

Preglednica 3 prikazuje odgovore na trditve, ki se nanašajo na odnos učencev do znanosti in tehnologije v družbi. Zajema 12 trditve, ki so jih učenci ovrednotili na 7-stopenjski Likertovi lestvici. Vrednosti aritmetičnih sredin (M), ki so višje od 4, smo upoštevali kot večinsko pozitivno stališče, vrednosti, ki so nižje od 4, pa kot večinsko negativno stališče. Učenci 7., 8. in 9. razreda so izrazili pozitivno stališče pri desetih trditvah ($M = 5,38-4,12$) in negativno stališče do dveh trditvev ($M = 2,88-2,75$). Najvišje so ocenili trditve, da so ženske in moški lahko dobri znanstveniki ($M = 5,38$, $SD = 2,00$) in inženirji ($M = 5,35$, $SD = 1,92$). Učenci so izrazili stališče, da znanost in tehnologija veljata za družbeno koristni. Kljub njihovemu zavedanju, da sta znanost in tehnologija pomembni za družbo, učenci na splošno ne želijo postati znanstveniki ($M = 2,75$, $SD = 1,82$) ali inženirji ($M = 2,88$, $SD = 1,78$).

Tabela 3

Porazdelitev vzorca glede na strinjanje učencev s posamezno trditvijo, ki se nanaša na odnos do znanosti v družbi.

Trditve	Strinjanje učencev s trditvami, ki se nanašajo na odnos do znanosti v družbi.										
		1	2	3	4	5	6	7	M	Me	SD
Rad bi bil znanstvenik.	f f%	182 35,5	105 20,5	65 12,7	57 11,1	49 9,6	34 6,6	21 4,1	2,75	2,00	1,82
Naša voda je zaradi tehnologij čistejša.	f f%	59 11,5	43 8,4	59 11,5	143 27,9	77 15,0	88 17,2	44 8,6	4,12	4,00	1,76
Znanstveniki načrtujejo in izdelujejo stvari, ki nam pomagajo v življenju.	f f%	39 7,6	18 3,5	33 6,4	74 14,4	100 19,5	156 30,4	93 18,1	4,98	5,00	1,72
Ženske, pa tudi moški, so lahko dobri znanstveniki.	f f%	55 10,7	17 3,3	16 3,1	51 9,9	44 8,6	113 22,0	217 42,3	5,38	6,00	2,00
Kot inženir moraš biti pameten.	f f%	44 8,6	19 3,7	34 6,6	72 14,0	120 23,4	139 27,1	85 16,6	4,88	5,00	1,74
Rad bi bil inženir.	f f%	157 30,6	107 20,9	64 12,5	80 15,6	52 10,1	35 6,8	18 3,5	2,88	2,00	1,78
Tehnologija nam omogoča razvoj zdravstva.	f f%	38 7,4	21 4,1	31 6,0	70 13,6	66 12,9	159 31,0	128 25,0	5,13	6,00	1,80
Naša voda je zaradi znanosti čistejša.	f f%	45 8,8	35 6,8	48 9,4	119 23,2	93 18,1	110 21,4	63 12,3	4,49	5,00	1,75
Inženirji načrtujejo in izdelujejo stvari, ki nam pomagajo v življenju.	f f%	30 5,8	24 4,7	34 6,6	90 17,5	90 17,5	140 27,3	105 20,5	5,00	5,00	1,70
Ženske, pa tudi moški, so lahko dobri inženirji.	f f%	45 8,8	15 2,9	21 4,1	70 13,6	51 9,9	104 20,3	207 40,4	5,35	6,00	1,92
Znanost je omogočila izdelavo boljših in varnejših zdravil.	f f%	36 7,0	20 3,9	25 4,9	67 13,1	64 12,5	160 31,2	141 27,5	5,24	6,00	1,78
Za znanost moraš biti pameten.	f f%	45 8,8	19 3,7	25 4,9	73 14,2	93 18,1	137 26,7	121 23,6	5,04	6,00	1,81

Interes za naravoslovje

Preglednica 4 prikazuje strinjanje učencev s posameznimi trditvami, ki se nanašajo na interes za naravoslovje. Učenci so večinsko izrazili pozitivna stališča pri vseh navedenih trditvah ($M = 2,14\text{--}3,02$). Najbolj pozitivno stališče so izrazili pri trditvi “Naravoslovje nam pomaga bolje razumeti naravo” ($M = 3,02$, $SD = 0,91$). S trditvijo se je strinjalo 80,1 % učencev. Najmanj pozitivno stališče smo zaznali pri trditvi “Ukvarjanje z naravoslovjem je ena mojih najljubših aktivnosti” ($M = 2,14$, $SD = 0,89$), s katero se je (zelo) strinjalo 32 % učencev.

Tabela 4

Porazdelitev vzorca glede na strinjanje učencev s posamezno trditvijo, ki se nanaša na interes za naravoslovje.

Trditve	Strinjanje učencev s trditvami, ki se nanašajo na interes za naravoslovje.							
		1	2	3	4	M	Me	SD
Zelo rad imam naravoslovje.	f f%	106 20,7	122 23,8	199 38,8	86 16,8	2,52	3,00	1,00
Ukvarjanje z naravoslovjem je ena mojih najljubših aktivnosti.	f f%	131 25,5	218 42,5	124 24,2	40 7,8	2,14	2,00	0,89
V šoli imam rad naravoslovne predmete.	f f%	106 20,7	148 28,8	174 33,9	85 16,6	2,46	3,00	1,00
Rad bi izvedel več o nekaterih stvareh, s katerimi se ukvarjamo pri naravoslovju.	f f%	97 18,9	164 32,0	170 33,1	82 16,0	2,46	2,00	0,97
Naravoslovje je pomembno zame.	f f%	93 18,1	129 25,1	223 43,5	68 13,3	2,52	3,00	0,94
Naravoslovje nam pomaga bolje razumeti naravo.	f f%	52 10,1	50 9,7	247 48,1	164 32,0	3,02	3,00	0,91
Naravoslovje je koristno za družbo.	f f%	76 14,8	87 17,0	242 47,2	108 21,1	2,75	3,00	0,95
Ugotavljam, da mi naravoslovje pomaga bolje razumeti svet okrog sebe.	f f%	74 14,4	97 18,9	218 42,5	124 24,2	2,76	3,00	0,98

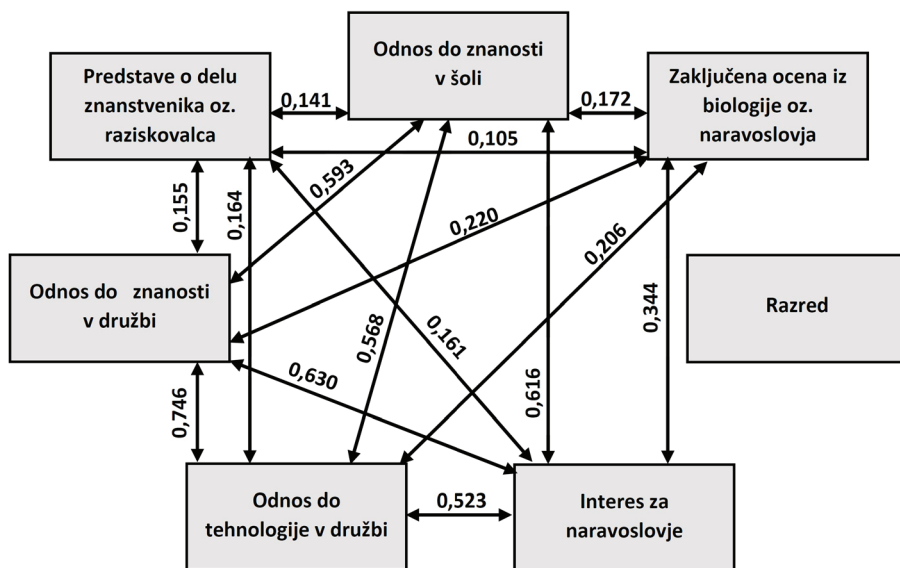
Korelacije med merjenimi spremenljivkami

Grafični prikaz (slika 1) opisuje statistično značilne korelacije med merjenimi spremenljivkami. S Pearsonovim koeficientom korelacije smo preverili povezavo med skupnim številom predstav o delu znanstvenika, učenčevim odnosom do znanosti v šoli, odnosom do znanosti in tehnologije v družbi, njihovim interesom za naravoslovje, zaključno oceno pri biologiji oz. naravoslovju ter razredom, ki ga trenutno obiskuje. Ugotavljamo statistično značilne pozitivne korelacije med številom predstav o delu znanstvenika,

odnosom do znanosti v šoli, odnosom do znanosti in tehnologije v družbi, interesom za naravoslovje ter zaključno oceno iz naravoslovja ali biologije. Ni pa statistično značilnih korelacij med razredom, ki ga obiskujejo učenci, ter drugimi spremenljivkami.

Slika 1

Grafični prikaz statistično značilnih korelacij med merjenimi spremenljivkami.



Preverili smo tudi, ali se med učenci, ki so imeli v lanskem šolskem letu naravoslovje ali biologijo zaključeno z višjo oceno, pojavljajo statistično pomembne razlike glede števila predstav o delu znanstvenika [$F(3, 486) = 2,734, p = 0,043$], v njihovem odnosu do znanosti v šoli [$F(3, 509) = 5,528, p = 0,001$], odnosu do znanosti v družbi [$F(3, 509) = 10,090, p < 0,001$], odnosu do tehnologije v družbi [$F(3, 509) = 7,607, p < 0,001$] in v interesu za naravoslovje [$F(3, 509) = 26,376, p < 0,001$]. Enosmerna analiza varianc (ANOVA) je pokazala statistično pomembne razlike. S Tukeyjevim post hoc testom smo ugotovili, da imajo učenci, katerih zaključna ocena je odlično (5), statistično značilno ($p < 0,05$) boljše predstave o delu znanstvenika, boljši odnos do znanosti v šoli, do znanosti in tehnologije v družbi in višji interes za naravoslovje, kot drugi učenci z oceno prav dobro (4), dobro (3) ali zadostno (2).

4 Diskusija in sklepi

V prvem raziskovalnem vprašanju nas je zanimalo, kakšne predstave imajo učenci o delu znanstvenikov. Uporabili smo kategorizacijo odgovorov iz raziskave Kenneth Jones in Hite (2020), ki sta se osredotočala na pozitivne in negativne asociacije o delu

znanstvenikov. Odgovori sodelujočih slovenskih učencev so bili zelo površinski. Učenci v odgovoru največkrat izpostavijo, da znanstveniki raziskujejo. Iz navedenih asociacij ne zaznavamo negativnih konotacij, ki jih omenjata raziskovalca v južnokorejski raziskavi (Kenneth Jones in Hite, 2020). Kenneth Jones in Hite (2020) ugotavljata, da prevladujejo pozitivne konotacije, vendar pa te bistveno ne vplivajo na karijerne odločitve učencev (Lee in Kim, 2018). Iz rezultatov raziskave lahko tudi sklepamo, da imajo osnovnošolci v tretjem vzgojno-izobraževalnem obdobju še zelo slabe predstave o delu znanstvenikov, čeprav vsi učni načrti za naravoslovne predmete vsebujejo splošne in operativne učne cilje, ki se navezujejo na raziskovanje in znanstveno delovanje (Program osnovna šola biologija. Učni načrt, 2011; Program osnovna šola fizika. Učni načrt, 2011; Program osnovna šola kemija. Učni načrt, 2011; Program osnovna šola naravoslovje. Učni načrt, 2011). V odgovorih nismo zasledili stereotipnih predstav o znanstvenikih (npr. znanstveniki so starejši moški, ki nosijo laboratorijske halje in delajo v zaprtih prostorih), kar je pogosto omenjeno v tujih raziskavah (Bozzato idr., 2021; Emvalotis in Koutsianou, 2018; Ferguson in Lezotte, 2020; Martins idr., 2023). To je lahko posledica dejstva, da smo učence prosili, naj napišejo, kaj delajo znanstveniki. V prej navedenih raziskavah pa so raziskovalci velikokrat zaprosili učence in dijake, da znanstvenika pri delu tudi narišejo; tako je bilo potrebno narisati oblačila in tudi druge fizične lastnosti znanstvenika. Morda bi se v našem primeru prav tako pojavile stereotipne predstave o znanstvenikih, če bi jih zaprosili za risbo znanstvenika pri delu. Tudi v raziskavi Chionas in Emvalotis (2022) so učencem zastavili zgolj vprašanja odprtih tipov in niso zasledili stereotipnih predstav. V nadaljnji raziskavi želimo še podrobneje proučiti predstave učencev o znanstvenikih in njihovem delu s pomočjo skupinskih intervjujev. Nadejamo se, da bomo tako dobili tudi vpogled v morebitne stereotipne predstave o znanstvenikih.

Pri drugem raziskovalnem vprašanju nas je zanimalo, kakšen je odnos učencev do raziskovalnega dela v šoli. Izpostavili smo že, da je spoznavanje značilnosti znanstvene metode sestavni del učnih načrtov naravoslovnih predmetov v slovenski osnovni šoli (Program osnovna šola biologija. Učni načrt, 2011; Program osnovna šola fizika. Učni načrt, 2011; Program osnovna šola kemija. Učni načrt, 2011; Program osnovna šola naravoslovje. Učni načrt, 2011). Iz rezultatov je razvidno, da imajo učenci pozitiven odnos do znanosti v šoli. Še posebej pozitivno je njihovo stališče do praktičnega dela v procesih učenja z raziskovanjem pri pouku. Negativna stališča učencev pa se pogosteje pojavijo pri stališčih do pisanja poročil o raziskovalnem delu v šoli. Dobljeni rezultati so primerljivi z raziskavo Silver in Rushton (2008); raziskovalca izpostavljata, da učenci niso želeli postati znanstveniki in predvidevata, da je vzrok lahko v tem, da učenci ne povezujejo šolskih dejavnosti z dejanskim delom znanstvenikov. Anketirani učenci nimajo odpora do znanosti. Tuje raziskave ugotavljajo, da lahko stereotipne predstave o znanstvenikih učence odvrčajo od tega, da bi postali znanstveniki (Lee in Kim, 2018; Scholes in Stahl, 2022; Silver in Rushton, 2008). V raziskavi Lee in Kim (2018) izpostavita, da bi lahko krepitev položaja znanosti v javnosti odpravila napačne predstave, kar bi posledično izboljšalo splošen odnos do znanstvenikov in znanstveno-raziskovalnega dela.

V tretjem raziskovalnem vprašanju nas je zanimalo, kakšne predstave imajo učenci o pomenu znanosti in tehnologije v družbi. Učenci znanost in tehnologijo ocenjujejo kot družbeno koristni področji. Znanost učenci ocenjujejo nekoliko višje od tehnologije. Kljub njihovemu zavedanju, da sta znanost in tehnologija pomembni za družbo, učenci

na splošno ne želijo postati znanstveniki ali inženirji, kar je skladno z izsledki primerljivih tujih raziskav (Kenneth Jones in Hite, 2020; Lee in Kim, 2018). Tudi v raziskavi Silver in Rushton (2008), kjer so uporabili enak vprašalnik s petošolci v Veliki Britaniji, ugotavljajo, da si učenci večinoma ne želijo postati znanstveniki ali inženirji. Na inženirstvo kot poklic so gledali nekoliko bolj naklonjeno kot na poklic znanstvenika. Na učenčevo dožemanje znanosti in znanstvenikov lahko vpliva več dejavnikov. Raziskave (Bartels in Lederman, 2022; Kenneth Jones in Hite, 2020; Lee in Kim, 2018; Scholes in Stahl, 2022) izpostavljajo, da na učenčeve predstave o znanosti in tehnologiji pomembno vpliva učiteljev odnos, domače okolje (stališča njihovih staršev do različnih poklicev), lokalno okolje, v katerem živi učenec, in mediji, katerim so učenci izpostavljeni v bistveno večji meri kot nekoč.

V raziskavi smo ugotavljali tudi učenčev interes za naravoslovje, predvsem smo želeli ugotoviti povezave med merjenimi spremenljivkami. Učenci so večinoma izrazili velik interes za naravoslovje in zavedajo se, da je naravoslovje pomembno. V številnih raziskavah (Kang idr., 2021; PISA, 2008; PISA, 2016; Roberts, 2007; Silver in Rushton, 2008; Simon in Osborne, 2010; TIMMS, 2016; Tytler idr., 2008) so raziskovali odnos učečih se do naravoslovja, kjer med drugim ugotavljajo, da težava ni v tem, da naravoslovje ni zanimivo, ampak da so drugi šolski predmeti zanimivejši od naravoslovja, kar potrjujejo tudi izsledki naše raziskave. Tuje raziskave tudi ugotavljajo, da so učenci, ki so imeli več informacij o naravoslovnih poklicih, povečali zanimanje za naravoslovje in v večjem številu posegli po naravoslovnem študiju in karieri na tem področju (Bartels in Lederman, 2022; Drymiotou idr., 2021; Kang idr., 2021). Raziskovalci so izpostavili, da bi bilo zato potrebno v učne načrte sistematično vključiti karierni vidik. Eden od pomembnih spodbujevalcev za dvig interesa za naravoslovje je, da pouk naravoslovja povežemo z učenčevim vsakdanom in družbo, v kateri živi (Broderick, 2021; Kang in Keinonen, 2018), saj s tem naredimo pouk bolj relevanten in tako učenci postanejo bolj pripravljeni za aktivno in odgovorno sodelovanje v demokratični družbi.

V raziskavi smo ugotovili statistično značilne pozitivne korelacije med številom predstav o delu znanstvenika, odnosom do znanosti v šoli, odnosom do znanosti in tehnologije v družbi, interesom za naravoslovje ter zaključno oceno iz naravoslovja ali biologije. Nismo pa zaznali statistično značilnih korelacij med razredom, ki ga učenci obiskujejo, ter drugimi merjenimi spremenljivkami. Učenci, ki so bolj dejavni pri naravoslovnih poskusih, kažejo več zanimanja za znanost in naravoslovje (Kang idr., 2019). V raziskavi Kang s sodelavci (2019) še poudarjajo, da je za ozaveščenost mladih o znanstveni karieri priporočljivo izvajati vzgojno-izobraževalne intervencije, ki upoštevajo pristne karierne izkušnje. V številnih državah se pojavlja dvom, čigava je primarna odgovornost zagotavljanja kariernih priložnosti z učenci. V slovenskem prostoru karierno usmerjanje osnovnošolcev vodi šolska svetovalna služba. Finska šolska reforma iz leta 2016 (Kang idr., 2019) izpostavlja potrebo po večji karierni ozaveščenosti učencev pri vsakem šolskem predmetu v sodelovanju s šolskimi svetovalci. Učitelji sami pogosto nimajo dovolj vpogleda v karierne možnosti in nimajo dovolj časa za svetovanje učenecem, zato je nujno medsebojno povezovanje učenca, učitelja in šolskega svetovalca.

Poučevanje naravoslovja in tehnologije je potrebno dopolniti z izkušnjami iz resničnega, vsakdanjega sveta, učenci pa morajo pridobiti realne znanstvene vzornike (Glažar in Devetak, 2013; Kang idr., 2019; Kenneth Jones in Hite, 2020; Lee in Kim, 2018). Le tako bomo lahko spodbudili njihov interes za naravoslovje in za kariero v

znanosti in tehnologiji. V ugotovitvah raziskave PISA (PISA, 2016) za slovensko populacijo 15-letnikov, ki so sodelovali v njej, lahko beremo (v primerjavi z njihovimi predhodniki v letu 2006) o bistveno nižjem uživanju v učenju naravoslovja. V nekaterih državah, na primer v Kanadi, Avstraliji, Veliki Britaniji, so v raziskavi PISA za leto 2015 zaznali povečanje interesa za učenje naravoslovja in tudi izboljšanje motivacije za učenje naravoslovja, kar pripisujejo prizadevanjem za bolj avtentičen, relevanten pouk naravoslovja (Kang idr., 2021).

Izsledki naše raziskave pomembno prispevajo k razumevanju različnih dejavnikov, ki vplivajo na znanstveno pismenost osnovnošolcev v slovenskem prostoru. V slovenskem prostoru učni načrti naravoslovnih predmetov vsebujejo splošne in operative učne cilje, ki učence seznanjajo z znanstvenimi metodami naravoslovja, vendar očitno premalo izpostavljam, da znanstveniki pri svojem delu uporabljajo znanstvene metode dela, kaj vse zajema znanstveno delovanje in kakšen je doprinos znanosti in tehnologije v družbi.

Andreja Dolenec, MA, Gregor Torkar, PhD

Students' Scientific Literacy in the third Educational Period

Students nowadays spend a lot of time on the Internet and are exposed to a great deal of information overload, so it is important that they learn to critically evaluate information as early as primary school. A scientifically literate person can judge whether certain information is credible. In this paper, we would like to highlight the importance of developing scientific literacy in primary school science classes. Science curricula in Slovenia contain general and operational learning objectives that introduce students to scientific methods. In the study, we follow the definition of scientific literacy as a knowledge matrix necessary to critically evaluate scientific reports. We aim to gain a more detailed insight into the scientific literacy of primary school students in the third educational period in Slovenia. In recent decades, interest in science has tended to decline, which has a negative impact on aspirations for a scientific career. Getting young people excited about science is an important goal of science education.

This opportunity can be provided by inquiry-based instruction. Blažič et al. (2003) defined inquiry-based instruction as a specific didactic strategy of scientific knowledge that introduces elements of scientific work into the classroom. In inquiry-based instruction, the student is in the role of active researcher. The importance of inquiry-based teaching is also recognized in Slovenia (Markuš and Čagran, 2017; Markuš and Hus, 2018).

Students mainly have problems with achieving scientific competencies in learning scientific concepts and have insufficiently developed skills for planning and conducting research (Glažar and Devetak, 2013). The authors also point out that in the context of science literacy, it is particularly important to develop the ability to understand the impact of science and technological development on our daily lives, and to identify problems. It is also important to apply strategies of active participation in solving problems (Glažar and Devetak, 2013).

Showing interest in science and not only supporting scientific research but also demonstrating the motivation to behave responsibly are important dimensions of the definition of scientific literacy in the PISA survey (PISA, 2008). The goal of science education in school is not only to stimulate interest in the subject, but also to provide career guidance so that students continue on the path to science careers after completing secondary education and remain interested in scientific questions in adulthood (DeBoer, 2000). In primary school education, it is critical to develop positive attitudes toward science among students in the early years. However, this is mainly influenced by teachers' attitudes towards science and technology (Glažar and Devetak, 2013). Based on the research problem and research objective, we asked ourselves the following research questions:

- What ideas do students have about the work of scientists?*
- What is the attitude of students towards research work at school?*
- What ideas do students have about the importance of science and technology in society?*

The research was based on a qualitative and quantitative approach to pedagogical research. We used a descriptive and causal non-experimental research method. In the research, data collection took place through a survey. The survey was completed by 513 students from 10 randomly selected Slovenian schools (170 7th grade students, 145 8th grade students, and 198 9th grade students).

We sent the school a link to the electronic questionnaire and instructions for the teacher who conducted the survey at the school. We gained an insight into students' ideas about scientific literacy using an adapted version of the questionnaire by Silver and Rushton (2008) and Kang et al. (2021).

We asked the students to answer the question "What do scientists do?". Their responses were coded into three categories. We used the categorization of responses from Kenneth Jones and Hite's (2020) survey, which focused on positive and negative associations about the work of scientists. With a sample of 513 students, we successfully categorized 674 student perceptions. The first category, called internalization of goals, included 87.8% of all ideas about the work of a scientist, wherein the students most often point out that the scientist is doing research. The second category covered the fields of science and technology. This category included 11.7% of all ideas about the work of a scientist. The third category, called working environment and equipment, included 0.4% of all perceptions. The answers of the participating Slovenian students were very superficial. In their answers, the students mostly point out that scientists only do research. We do not perceive any negative connotations from the above associations. From the results of the research, we can also conclude that primary school students in the third educational period still have very poor ideas about the work of scientists, even though all the curricula in Slovenian schools for natural science subjects contain general and operational learning objectives related to research and scientific activity. In the answers, we did not find stereotypical ideas about scientists (e.g., scientists are older men who wear lab coats and work indoors), which is often mentioned in foreign research (Bozzato et al., 2021; Emvalotis and Koutsianou, 2018; Ferguson and Lezotte, 2020; Martins, 2023).

In the second research question, we are interested in the students' attitude towards research work at school. The questionnaire, which determines the student's attitude to-

wards science at school, includes 11 statements that the students evaluated on a seven-point Likert scale. Arithmetic mean values (M) higher than 4 were taken into account as the majority positive opinion, and values lower than 4 as the majority negative opinion. 7th, 8th and 9th grade students expressed a positive attitude towards ten statements ($M = 5.85 - 4.48$) and a negative attitude towards one statement ($M = 3.75$). The majority (74%) of students agreed with the statement that they (very much) like working with their classmates during research work ($M = 5.85$, $SD = 1.54$). However, they like writing lab reports the least ($M = 3.75$, $SD = 1.80$). The obtained results are comparable to the research of Silver and Rushton (2008); the two researchers point out that the students did not want to become scientists and assume that the reason may be that the students do not connect school activities with the actual work of scientists.

In the third research question, we were interested in what ideas students have about the importance of science and technology in society. The questionnaire, which determines the students' attitude towards science and technology in society, includes 12 statements that the students evaluated on a seven-point Likert scale. Arithmetic mean values (M) higher than 4 were taken into account as the majority positive opinion, and values lower than 4 as the majority negative opinion. 7th, 8th and 9th grade students expressed a positive attitude towards ten statements ($M = 5.38 - 4.12$) and a negative attitude towards two statements ($M = 2.88 - 2.75$). They rated the statement that men and women can be good scientists ($M = 5.38$, $SD = 2.00$) and engineers ($M = 5.35$, $SD = 1.92$) the highest. Students expressed the view that science and technology are considered socially beneficial. Despite their awareness that science and technology are important to society, students generally do not want to become scientists ($M = 2.75$, $SD = 1.82$) or engineers ($M = 2.88$, $SD = 1.78$). The results of our research are consistent with the findings of comparable foreign research (Kenneth Jones & Hite, 2020; Lee & Kim, 2018). Moreover, in conducting research among 5th graders in Great Britain using the same questionnaire, Silver and Rushton (2008) found that the students mostly do not want to become scientists or engineers.

We tested the students' interest in science with eight statements. The students evaluated them on a four-point Likert scale. The majority of students expressed positive views on all the given statements ($M = 2.14 - 3.02$). The most positive attitude was expressed in the statement "Natural science helps us to better understand nature" ($M = 3.02$, $SD = 0.91$). A total of 80.1% of students agreed with the statement. The least positive attitude was found in the statement "Dealing with science is one of my favourite activities" ($M = 2.14$, $SD = 0.89$), with which 32% of students (strongly) agreed. In many studies (Kang et al., 2021; PISA, 2008, 2016; Roberts, 2007; Silver and Rushton, 2008; Simon and Osborne, 2010; TIMMS, 2016; Tytler et al., 2008) they investigated the attitude of learners towards natural sciences, where, among other things, they find that the problem is not that natural science is not interesting, but that other school subjects are more interesting than natural science, which has also been confirmed by the results of our research. Foreign research also finds that students who had more information about science careers increased their interest in science and thus their desire for science studies and careers (Bartels and Lederman, 2022; Drymiotou et al., 2021; Kang et al., 2021). The researchers pointed out that for this purpose it would be necessary to systematically include a career aspect in the curricula.

Using the Pearson correlation coefficient we checked the connection between the total number of ideas about the work of a scientist, the students' attitude towards science in school, the attitude towards science and technology in society, their interest in natural sciences, the final grade in biology or natural science, and the classes they are currently attending. We find statistically significant positive correlations between the number of ideas about the work of a scientist, the attitude towards science in school, the attitude towards science and technology in society, interest in science, and the final grade in science or biology. However, there are no statistically significant correlations between the class attended by students and other variables.

The results of our research significantly contribute to the understanding of various factors that influence the scientific literacy of primary school students in Slovenia. Science curricula in Slovenia include learning objectives that introduce students to scientific methods, but we should clearly emphasize more strongly that scientists use scientific methods in their work, what scientific activities involve, and what contribution science and technology make to society.

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Mag. Andreja Dolenec, učiteljica biologije in kemije na OŠ Šmartno pod Šmarno goro v Ljubljani; asistentka na Oddelku za biologijo, kemijo in gospodinjstvo na Pedagoški fakulteti Univerze v Ljubljani.
E-mail: andreja.dolenec@gmail.com

Dr. Gregor Torkar, izredni profesor za področje biološkega izobraževanja na Oddelku za biologijo, kemijo in gospodinjstvo na Pedagoški fakulteti Univerze v Ljubljani.
E-mail: gregor.torkar@pef.uni-lj.si

Comparison of Global Competencies in General and Vocational Education

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KLJUČNE BESEDE: globalne kompetence, PISA 2018, Slovenija, gimnazijski programi, poklicni programi

POVZETEK – Članek se osredotoča na globalne kompetence v znanstvenih in (javno)političnih razpravah, opredeljene kot skupek znanj, spretnosti, stališč in vrednot, ključnih za uspešno osebno in poklicno življenje v globaliziranem svetu. Preučuje rezultate raziskave PISA 2018, ki kažejo, da so učenci v Sloveniji svoje globalne kompetence ocenili pod povprečjem OECD. Ukvarja se z znanstveno relevantnimi vprašanji ali, kako in zakaj učenci in učenke v gimnazijskih in poklicnih srednješolskih programih v Sloveniji (ne) poročajo o enaki ravni globalnih kompetenc. Rezultati kažejo, da učenci in učenke poklicnih izobraževalnih programov v primerjavi z učenci in učenkami gimnazijskih programov poročajo o bistveno nižjih globalnih kompetencah, a o bistveno več priložnostih za učenje globalnih vsebin v šoli. Rezultati, ki kažejo, da so v Sloveniji učenci in učenke z nižjim socialno-ekonomskim statusom vključeni predvsem v programe poklicnega izobraževanja in da možnosti za pridobivanje globalnih kompetenc v šoli niso bistveno povezane s samoocenjenimi globalnimi kompetencami (zavedanjem globalnih vprašanj), postavljajo pod vprašaj kompenzacijsko vlogo šole pri pridobivanju globalnih kompetenc učencev in učenek.

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ABSTRACT – The article deals with global competencies, understood in academic and policy discussions as a set of knowledge, skills, attitudes and values crucial for successful personal and professional life in a globalized world. It examines the PISA 2018 results, which show that students in Slovenia self-assessed their global competencies below the OECD average. It addresses the scientifically relevant questions of whether, how and why students in Slovenia in general and vocational upper-secondary programmes (do not) report the same level of global competencies. The results show that students in vocational education programmes in comparison to students in general education programmes report significantly lower global competencies but significantly higher learning opportunities on global issues at school. The results, which show that in Slovenia students with lower socioeconomic status are mainly involved in vocational education programmes and that opportunities for acquiring global competencies in school are not significantly related to the self-reported global competencies (awareness of global issues), question the compensating role of school in the acquisition of global competencies by students.

1 Introduction

The challenges of globalization require education systems to pay special attention to the education of global citizens who, with their global competencies, will be able to live in an increasingly interdependent, multicultural and rapidly changing world (e.g., OECD, 2020). While the theoretical foundations for global citizenship education date back to 1970 (e.g., Bourn, 2020), the measurement of global competencies has gained attention, especially in the last decades. The Programme for International Students Assessment (PISA, 2018) is the first study which assessed the global competencies of students around the world from an international comparative perspective. In its analyti-

cal framework, global competencies are understood as “the capacity to examine local, global and intercultural issues, to understand and appreciate the perspectives and world views of others, to engage in open, appropriate and effective interactions with people from different cultures, and to act for collective well-being and sustainable development” (OECD, 2018, p. 7). In addition to international comparisons, its data provides in-depth insights into the acquisition of global competencies by 15-year-old students within the national education systems, including differences between different educational tracks.

(Global) citizenship competencies in general and vocational education programmes

Part of the mission of modern education systems is to foster formally equal citizens by promoting the reproduction of essential conditions for democratic governance (Nylund et al., 2020; Sinjur, 2016). The main aim of education is to prepare students for successful participation in society and the labour market, and thus support their societal integration (Van Der Werfhost, 2017). Unequal access to opportunities to learn citizenship has been identified as an important factor that contributes to socioeconomic inequalities in later civic engagement (Hoskins et al., 2021) and thus affects the social cohesiveness of society (e.g., Van Goethem et al., 2020). Although the role of school in equipping students for later civic engagement has been well recognized, the research (e.g., Nylund et al., 2022) shows that not all students have the same learning opportunities on these issues at school (Oblak and Lavrič, 2019). The data show that in most European Union member states, including Slovenia, the general upper-secondary education programmes (GEP) and the vocational upper-secondary education programmes (VEP) differ significantly in terms of individual students’ factors (e.g., economic, social and cultural status – ESCS, prior educational experience, etc.), as well as systemic and school-level factors (goals, programmes, curricula, teacher training programmes), which may be related to future (global) civic and citizenship engagement.

Using pooled European Social Survey data collected between 2002 and 2012 from 24 European countries, Van der Werfhorst (2017) demonstrated that adults educated in VEP had lower levels of political engagement than adults educated in GEP (Van der Werfhorst, 2017). Similarly, Hoskins et al. (2014) found that 16 to 18-year-old students enrolled in VEP in Germany, England, and Denmark reported the intention to take part in elections less often than students in GEP. Dijkstra et al. (2021) note that students in GEP in comparison to their peers in VEP have greater civic knowledge (see also Van der Wal and Waslander, 2007); they are more supportive of equal rights for ethnic groups; they participate in more civic activities at school and rate them as important; they report a classroom climate that is open to discussion and more positive relationships between students and teachers. The students of GEP are more convinced that critical citizenship and personal development are important, while students of VEP are more focused on citizenship oriented towards adaptation and socially desirable behaviour. At the same time, Dijkstra et al. (2021) did not detect any differences between the education programmes regarding students’ confidence in their civic competencies and participation. Nylund et al. (2022) highlight that the curricula in GEP “provide substantially different opportunities to foster understanding and self-confidence to exert influence in work-

places or society”. GEP enable conceptual knowledge and training in critical thinking and active citizenship. These are lacking in VEP, although they seem to be very valuable in terms of acquiring “knowledge that enables the questioning of prevailing conditions”, “to address situations in vocational environments and exert influence at workplaces”, as well as to be engaged in civic issues (exerting influence through trade unions, etc.).

In this regard, the European Parliament (2022) recognized that VEP devotes lower attention to citizenship education in comparison to GEP. This is not only evident in the curricula and other learning opportunities on (global) citizenship issues at school, students’ civic knowledge and dispositions, but also in society and teachers’ views of citizenship education in different educational tracks (see Leenders et al., 2008; Van Goethem et al., 2020).

Research gap and the aim of the research

Van der Werfhorst (2017) highlights that although “civicness” can be regarded as one of the most important educational goals, the question of its realization in different education programmes has been neglected in the research. With few exceptions, such studies have not been directed towards VEP (Nylund et al., 2022).

Van De Werfhorst (2017) highlights that education systems (including general and vocational tracks) differ; therefore, it is important to consider a particular education system when addressing specific educational issues. The national strategic framework in Slovenia (see Šterman Ivančič and Štremfel, 2023) sets the acquisition of global competencies by students as an important educational goal. Research attention has already been devoted to the individual factors related to global competencies, e.g., gender, migrant background, ESCS (Šterman Ivančič and Štremfel, 2022), while the school factors, such as the educational track, have not been studied yet. Slovenia provides an interesting context for such investigation since, with its post-socialist past and current education policy goals, it has been regarded as a strong proponent of equity in education, also as regards the civics dimension of education. By focusing on the issue of the global competencies of students in Slovenia in GEP and VEP in the PISA 2018 data, the article addresses the topical national issue while also filling the research gap and contributing to the scientific discussions in the wider (global) citizenship education research field.

In this framework, the paper aims to answer the following research questions:

- Do the self-assessed global competencies of students attending GEP and VEP in Slovenia differ significantly?
- Do students in GEP and VEP report the same learning opportunities on global issues at school?
- How are the reported learning opportunities on global issues at school related to students’ awareness (i.e., knowledge) of global issues?
- Are the differences between education programmes just as evident when students’ ESCS is taken into consideration?
- What are the implications of the research findings for policy and practice?

2 Method

To answer the research questions, we conducted secondary analyses of the OECD PISA 2018 data for which the method (participants, instruments, and data analysis) is explained in the following paragraphs.

Participants

The final sample in the analysis includes a representative sample of 6074 15-year-old male and female students, of whom 2882 (47%) are female and 3192 (53%) are male. 2054 (34%) students attended GEP, 2578 (42%) attended technical education programmes, and 1442 (24%) students attended vocational education programmes of medium duration.

Instruments

After a 2-hour PISA 2018 reading, mathematics, and science literacy test, the students completed the student questionnaire, which is used to identify the effects of different background factors on student achievement. For the analysis, we used students' self-reports on their ESCS, global competencies, and learning opportunities on different global issues at school.

PISA 2018 measured students' self-reports on different *Global competencies scales*: Self-efficacy regarding global issues; Awareness of global issues; Attitudes towards immigrants; Interest in learning about other cultures; Perspective taking; Cognitive flexibility/adaptability; Respect for people from other cultures; Awareness of intercultural communication; and Sense of global-mindedness. All the mentioned scales and corresponding items are described in detail in the PISA 2018 Technical Report (OECD, 2021). All the scales showed good internal consistency for the Slovenian sample, with the coefficient alpha values ranging between $\alpha = .83$ and $\alpha = .93$ (OECD, 2021). Since we were especially interested in the connections between students' self-reported awareness of global issues (i.e., knowledge about global issues) and their opportunities to learn about different global issues at school, we describe these two scales in more detail.

Students' awareness of global issues was measured by PISA with the question "How informed are you about the following topics?": "Climate change and global warming", "Global health (e.g., epidemics)", "Migration (movement of people)", "International conflicts", "Hunger or malnutrition in different parts of the world", "Causes of poverty" and "Equality between men and women in different parts of the world". Students rated the items on a four-point scale (ranging from 1 – I have never heard of this to 4 – I am familiar with this and I would be able to explain this well).

Learning opportunities on global issues were measured by PISA with the question "Do you learn the following at school?" Students responded with "Yes" or "No" to the following items: "I learn how to solve conflicts with other people in our classrooms",

“I analyse global issues together with my classmates in small groups during class”, “I learn how people from different cultures can have different perspectives on some issues”, and “I learn how to communicate with people from different backgrounds”.

The PISA 2018 *Index of Economic, Social, and Cultural Status* (ESCS) consists of data on the highest level of education attained by both parents, the parents' occupation, and material and cultural goods in the home environment.

Data analysis

For the analysis, we used the standardized values of indices for Slovenia for students' ESCS and all the global competencies scales, and the percentages of students that answered “Yes” on each item on learning opportunities on the global issues scale. For all of the above, we used the existing values from the PISA 2018 database.

To answer the research questions, we did the following in the analysis:

- we first compared the average value of the ESCS index between different education programmes in Slovenia;
- we compared the average values of global competence indices and the percentages of students that answered “Yes” on a specific learning opportunities scale between secondary GEP and VEP of medium duration; and
- we tested the correlations between students' self-reported awareness of global issues and learning opportunities on global issues within GEP and VEP of medium duration.

The statistical significance of differences between the groups of students was tested using a t-test at a significance level of $p \leq .05$. For the correlations between the variables, the point-biserial correlation coefficient at a significance level of $p \leq .05$ was used.

Data were analysed using the statistical software IEA IDB Analyzer (Version 5.0.18). Due to two-stage sampling in the study and the use of weights for individual students (W_FSTUWT), this software also allowed us to use sample weights to properly assess the standard parameter errors in the population using the bootstrap method.

3 Results

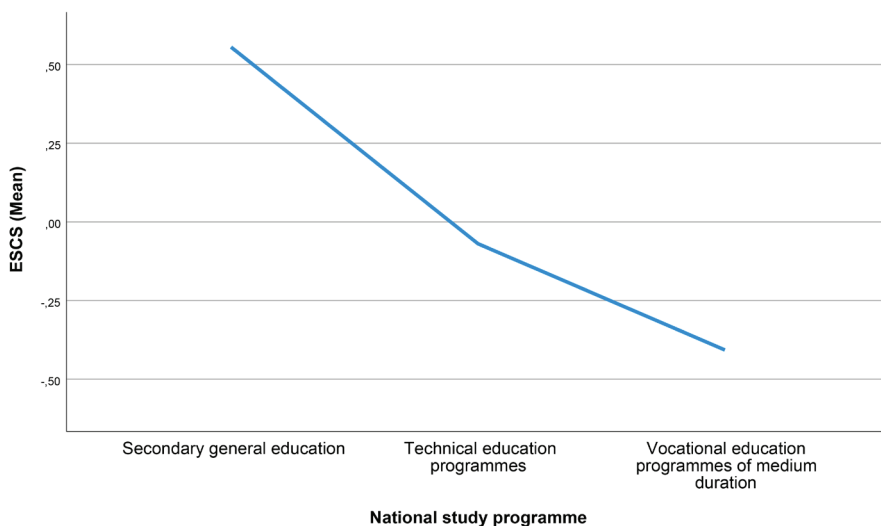
Results in Graph 1 show there are significant differences in students' ESCS according to the education programme they attend. The average value of the ESCS index in general upper-secondary education is .56, in technical education programmes -.07, and in vocational education programmes of medium duration -.41.

The results indicate that education programmes in Slovenia represent relatively homogeneous groups of students according to the ESCS. Since the largest differences have been observed with regard to achievement, ESCS and other factors of student achievement and adaptive learning behaviour between GEP and VEP of medium duration – further referred to as VEP – (e.g., Puklek Levpušček et al., 2012), in further analyses, we

will be interested in the differences in global competencies and learning opportunities on global issues between these two groups of students.

Graph 1

Differences in Students' ESCS According to Upper-Secondary Education Programme in Slovenia



Further results (Table 1) show that there are significant differences in all dimensions of global competencies between students attending GEP and those attending VEP. Students in VEP reported low global competencies on all scales (below the OECD average). The largest differences in self-reported global competencies between the two groups were found in “Respect for people from other cultures” (.24 vs. -.49), “Self-efficacy regarding global issues” (.16 vs. -.43) and “Awareness of global issues” (.22 vs. -.37); the smallest differences were found in self-reported “Cognitive flexibility/adaptability” (.08 vs. -.10).

Table 1*Self-Reported Global Competencies of Students in GEP and VEP*

	<i>GEP</i>		<i>VEP</i>	
	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
Respect for people from other cultures	.24	.03	-.49	.03
Self-efficacy regarding global issues	.16	.03	-.43	.03
Awareness of global issues	.22	.03	-.37	.03
Awareness of intercultural communication	.04	.03	-.53	.03
Attitudes towards immigrants	.14	.03	-.34	.03
Interest in learning about other cultures	.13	.03	-.30	.03
Sense of global-mindedness	.08	.03	-.30	.04
Perspective taking	.13	.03	-.15	.03
Cognitive flexibility/adaptability	.08	.03	-.10	.03

Note. GEP – general upper-secondary education programme; VEP – vocational upper-secondary programme of medium duration; M – mean; SE – standard error; Differences between the two groups are listed in descending order. All the differences between the groups proved to be statistically significant at the level of $p \leq .05$.

The contrary was found in analysing the differences in self-reported learning opportunities on global issues between students attending GEP and those attending VEP. As is evident from Table 2, the results show that students who attended VEP on average reported a higher percentage of agreement with all the items on the scale, except for the item related to learning about other cultures in the classroom.

Students from both programmes (Table 2) reported the highest percentage of agreement with the item related to learning about other cultures in the classroom, and, in addition to this item, the highest percentage of agreement was also reported with the item relating to learning about conflict resolution with other people. Moreover, students from both education programmes reported the lowest percentages of agreement with the item related to reading newspapers, searching for news online, or watching news reports together in class, and with the item related to being asked by teachers for their opinion on international news in class.

Table 2*Self-Reported Learning Opportunities on Global Issues between Students in GEP and VEP*

	<i>GEP</i>		<i>VEP</i>	
	<i>%</i>	<i>SE</i>	<i>%</i>	<i>SE</i>
I learn about the interconnectedness of countries' economies.	35.60	1.46	56.13	1.50
I learn how to solve conflicts with other people in our classrooms.	53.28	1.37	58.74	1.57
I learn about different cultures.	71.99	1.60	62.76	1.43
We read newspapers, look for news on the Internet or watch the news together during classes.	20.39	1.24	37.47	1.73
I am often invited by my teachers to give my personal opinion about international news.	28.60	1.26	40.58	1.62
I participate in events celebrating cultural diversity throughout the school year.	29.93	1.60	38.61	1.52
I participate in classroom discussions about world events as part of the regular instruction.	36.35	1.70	44.28	1.84
I analyse global issues together with my classmates in small groups during class.	29.16	1.57	43.14	1.47
I learn how people from different cultures can have different perspectives on some issues.	42.13	1.44	49.81	1.84
I learn how to communicate with people from different backgrounds.	44.77	1.49	50.47	1.70

Note. GEP – general upper-secondary education programme; VEP – vocational upper-secondary education programme of medium duration; % – percentage of students that responded with a “Yes”; SE – standard error.

The results so far indicate that students who attended VEP, i.e., students with lower ESCS, on average reported significantly lower global competencies, but on the contrary, greater learning opportunities on global issues than their peers who attended GEP. This indicates that students' ESCS does not play an important role in students' self-reported learning opportunities on global issues.

Further results are in line with these findings. As is evident from Table 3, the results show that students' self-reported awareness of global issues (i.e., their knowledge of global issues) is significantly low but negatively correlated with all the items on learning opportunities on the global issues scale, regardless of the education programme, with values of correlation coefficients ranging from -.13 to -.02 in general upper-secondary education programmes and from -.12 to .00 in vocational education programmes.

Table 3

Correlation Coefficients between Students' Self-Reported Awareness of Global Issues and Learning Opportunities on Global Issues in GEP and VEP

	GEP		VEP	
	r_{pb}	SE	r_{pb}	SE
Awareness of global issues	1.00	.00	1.00	.00
I learn about the interconnectedness of countries' economies.	-.07**	.04	-.11**	.03
I learn how to solve conflicts with other people in our classrooms.	-.07**	.04	-.12**	.04
I learn about different cultures.	-.09**	.03	-.08**	.04
We read newspapers, look for news on the Internet or watch the news together during classes.	-.02*	.04	-.05*	.04
I am often invited by my teachers to give my personal opinion about international news.	-.05*	.04	-.01*	.04
I participate in events celebrating cultural diversity throughout the school year.	-.12**	.04	-.01*	.04
I participate in classroom discussions about world events as part of the regular instruction.	-.13**	.04	.00	.04
I analyse global issues together with my classmates in small groups during class.	-.05*	.03	.00	.04
I learn how people from different cultures can have different perspectives on some issues.	-.05*	.03	-.11**	.04
I learn how to communicate with people from different backgrounds.	-.06**	.03	-.06**	.03

Note. GEP – general upper-secondary education programme; VEP – vocational upper-secondary education programme of medium duration; r – point-biserial correlation coefficient; SE – standard error; ** Correlation is significant at the level of $p \leq .01$; * Correlation is significant at the level of $p \leq .05$.

4 Discussion

The results show that Slovenian students in VEP report significantly lower global competencies in comparison to students in GEP. This holds for all nine dimensions of global competencies. These results are consistent with the existing research on students' civic competencies, e.g., students in GEP have greater civic knowledge and more positive attitudes towards migrants (e.g., Dijkstra et al., 2021). The results, which show that Slovenian students in VEP report greater learning opportunities on global issues at school, are not consistent with the existing research, which mainly highlights fewer learning opportunities on (global) citizenship issues in VEP. Finally, the results show that students' reports about the learning opportunities on global issues at school are

negatively related to the reported awareness of global issues (i.e., knowledge of global issues). These are not consistent with the results, which show that learning opportunities on global issues in most OECD countries are positively related to global competencies (OECD, 2020).

These findings raise several questions about the organization and content of global citizenship learning in VEP in Slovenia. Firstly, it raises the question of the quality of these learning opportunities (Oblak and Lavrič, 2019), for which it can be argued that effectiveness is limited. However, the question of the reliability of students' understanding and reporting about the learning opportunities should not be neglected in this regard. Secondly, it calls into question the compensating role of vocational schools in promoting students' global competencies. Taking into consideration the existing research findings that ESCS is an important individual factor related to global competencies (e.g., Smith et al., 2017), also in Slovenia, and that students with low ESCS are mainly involved in VEP, it seems that vocational schools in Slovenia do not compensate this individual factor and do not enable deprived students to develop global competencies in schools.

5 Conclusions

In 2024, Slovenia is in the process of renewing the curricula and preparing a new programme for education for the next decade, which makes the results of this article topical and policy relevant. The article shows that in the area of global competencies, just as in the area of basic competencies (reading, math, science literacy), ensuring equal opportunities and thus equity remains one of the important challenges of the Slovenian education system (cf. Cankar et al., 2017; Šterman Ivančič and Štremfel, 2020). The revealed differences in the global competencies of students in general and vocational education programmes support the idea (e.g., Demaine, 2002) that global competencies shed light on (in)equality and (in)just opportunities of citizens within nation-states (Sinjur, 2016). This has implications for educational practice.

First of all, the students' backgrounds (e.g., ESCS, academic abilities) should be taken into consideration when planning effective learning opportunities on global issues (e.g., Van de Werfhorst, 2017). Taking into consideration the discussion about the aim of vocational education, it is important that it not only pursues the employability goal (Kunc et al., 2020), but the active citizenship dimension as well. From this perspective, the basic knowledge about the global world should be strengthened. Studies (e.g., Dijkstra et al., 2021) report that this is often lacking in VEP, but is crucial and necessary for developing all other virtues of modern global citizens, e.g., skills, attitudes, values (Štremfel and Šterman Ivančič, 2022). As highlighted by Nylund et al. (2020), these learning opportunities should be focused not only on general subjects but also on vocational ones, as these hold the same dispositions for global citizenship learning. Thus, VEP would fulfil their compensating role in developing the global competencies of their students.

Dr. Urška Štremfel, dr. Klaudija Šterman Ivančič

Primerjava globalnih kompetenc v gimnazijskem in poklicnem izobraževanju

Izzivi globalizacije sprožajo potrebo, da izobraževalni sistemi posebno pozornost namenijo izobraževanju globalnih državljanov, ki bodo lahko s svojimi globalnimi kompetencami uspešno delovali v vse bolj soodvisnem, multikulturnem in hitro spreminjajočem se svetu. Slovenija je v letu 2018 sodelovala v raziskavi PISA (Program mednarodne primerjave dosežkov učencev), ki je prvič spremljala globalne kompetence učencev in učenek v mednarodni primerjalni perspektivi. Te v skladu s konceptualnim okvirom raziskave vključujejo preučevanje lokalnih, globalnih in medkulturnih vprašanj, razumevanje in spoštovanje različnih pogledov na svet, vključevanje v pozitivne interakcije z ljudmi iz različnih kultur in aktivno delovanje za skupno blaginjo ter trajnostni razvoj (OECD, 2020). Rezultati raziskave kažejo, da so slovenski učenci in učenke, v primerjavi z vrstniki iz držav OECD, poročali o statistično značilno nižjih globalnih kompetencah. Medtem ko je bila dosedanja raziskovalna pozornost v Sloveniji namenjena predvsem individualnim dejavnikom, ki osvetljujejo navedene rezultate, se v prispevku osredotočamo na šolske dejavnike oziroma na razlike v poročanih globalnih kompetencah ter priložnostih za usvajanje globalnih kompetenc med učenci in učenkami gimnazijskih in poklicnih srednješolskih programov. S tem zapolnjujemo raziskovalne vrzeli ter prispevamo k znanstvenim razpravam na širšem področju razvoja (globalnih) državljskih kompetenc v šolskem okolju. Redke obstoječe raziskave sicer kažejo, da je v programih poklicnega izobraževanja, v primerjavi z gimnazijskimi programi, manj pozornosti namenjene (globalni) državljski vzgoji. To je razvidno ne le v učnih načrtih in drugih priložnostih za usvajanje globalnih kompetenc v šoli, državljskemu znanju in dispozicijah učencev in učenek, ampak tudi v pogledih družbe in učiteljev na cilje (globalne) državljske vzgoje v različnih izobraževalnih programih (npr. Leenders idr., 2008; Van Goethem idr., 2020). Neenak dostop do priložnosti za razvoj državljskih kompetenc je bil v raziskavah prepoznan kot pomemben dejavnik, ki prispeva k socialno-ekonomskim neenakostim pri kasnejšem državljskem udejstvovanju (Hoskins idr., 2021) in tako vpliva na socialno kohezivnost družbe (npr. Van Goethem idr., 2020).

V prispevku odgovarjamo na naslednja raziskovalna vprašanja: Ali učenci in učenke gimnazijskih in poklicnih srednješolskih programov v Sloveniji poročajo o enaki ravni globalnih kompetenc? Ali učenci in učenke v gimnazijskih in poklicnih srednješolskih programih poročajo o enakih priložnostih za usvajanje globalnih kompetenc v šoli? Kako so poročane priložnosti za učenje o globalnih vprašanjih v šoli povezane s poročanim zavedanjem učencev o globalnih vprašanjih? Ali so razlike med izobraževalnimi programi prav tako značilne, če upoštevamo socialno-ekonomski status učencev in učenek? Kakšne implikacije prinašajo rezultati za politiko in prakso? Da bi odgovorili na raziskovalna vprašanja, smo izvedli sekundarne analize podatkov OECD PISA 2018. Končni vzorec v analizi zajema reprezentativen vzorec 6074 15-letnih učencev in učenek, od tega 2882 (47%) učenek in 3192 (53%) učencev. 2054 (34%) učencev in učenek je obiskovalo gimnazijske programe, 2578 (42%) programe tehničnega izobraževanja in

1442 (24 %) programe srednjega poklicnega izobraževanja. Podatke smo analizirali s statističnim programom IBM SPSS 27.0 in z orodjem IEA IDB Analyzer Version 4.0.35.

V raziskavi PISA 2018 so učenci in učenke podali samooceno na različnih lestvicah globalnih kompetenc: samoučinkovitost pri pojasnjevanju globalnih vprašanj, zavedanje o globalnih vprašanjih, odnos do priseljencev, zanimanje za spoznavanje drugih kultur, razumevanje perspektive drugih, spretnost miselnega prilagajanja, spoštovanje ljudi iz drugih kultur, spretnost medkulturne komunikacije, odzivnost na globalna vprašanja in diskriminatorno vedenje učiteljev na šoli. Vse lestvice so za slovenski vzorec pokazale dobro notranjo skladnost, saj so se vrednosti koeficienta alfa gibale med $\alpha = 0,83$ in $\alpha = 0,93$ (OECD, 2021). V prispevku nas je še posebej zanimala povezava med samooceno učenčevega zavedanja o globalnih vprašanjih (tj. znanja o globalnih vprašanjih) in njihovimi priložnostmi za učenje o različnih globalnih vprašanjih v šoli. Pri ugotavljanju zavedanja o globalnih vprašanjih so učenci in učenke odgovarjali na vprašanje "Koliko si obveščen/-a o naslednjih problemih?" Pripadajoče postavke so ocenili na štiristopenjski lestvici (1 – Nikoli nisem slišal/-a za to do 4 – Ta problem poznam in bi lahko precej dobro pojasnil/-a, za kaj gre), primeri postavk pa so naslednji: "Podnebne spremembe in globalno segrevanje", "Svetovno zdravje (npr. epidemije)", "Preseljevanje (selitev ljudi)" ipd. Priložnosti za usvajanje globalnih kompetenc v šoli je raziskava PISA ugotavljala z vprašanjem "Se v šoli учиš naslednje?" Učenci in učenke so na pripadajoče postavke odgovorili z "Da" ali "Ne", ocenili pa so deset postavk, ki se nanašajo na različne globalne kompetence, npr.: "Učim se o medsebojni povezanosti gospodarstev držav", "V razredu se učim reševati spore z drugimi ljudmi", "Pri rednem pouku se udeležujem razrednih razprav o svetovnih dogodkih", "Učim se, kako se sporazumevati z ljudmi iz drugačnih kulturnih ozadij". Indeks socialno-ekonomskega statusa učencev in učenek je v raziskavi PISA (2018) sestavljen iz podatkov o najvišji stopnji dosežene izobrazbe obeh staršev, poklicu staršev ter materialnih in kulturnih dobrinah v domačem okolju.

Rezultati kažejo, da v Sloveniji obstajajo velike razlike v socialno-ekonomskem statusu učencev in učenek glede na srednješolski izobraževalni program, ki ga obiskujejo. Povprečna vrednost indeksa v gimnazijskih programih je 0,56, v programih tehničnega poklicnega izobraževanja –0,07, v programih srednjega poklicnega izobraževanja pa –0,41.

Rezultati kažejo, da učenci in učenke v gimnazijskih programih v primerjavi z učenci in učenkami v poklicnih srednješolskih programih poročajo o pomembno višjih globalnih kompetencah v vseh dimenzijah globalnih kompetenc (odnos do priseljencev, zanimanje za spoznavanje drugih kultur, razumevanje perspektive drugih, spretnost miselnega prilagajanja, spoštovanje ljudi iz drugih kultur, spretnost medkulturne komunikacije, odzivnost na globalna vprašanja, diskriminatorno vedenje učiteljev na šoli).

Nasprotno rezultati kažejo, da so učenci in učenke v poklicnih srednješolskih programih v primerjavi z učenci in učenkami v gimnazijskih programih poročali o več priložnostih za usvajanje globalnih kompetenc v šoli pri vseh postavkah, razen pri postavki, ki se nanaša na učenje o drugačnih kulturah, pri kateri so o več priložnostih poročali učenci in učenke gimnazijskih programov.

Nadalje rezultati kažejo, da je samoocena učenčevega zavedanja o globalnih vprašanjih (tj. znanja o globalnih vprašanjih) negativno povezana z vsemi postavkami, ki se

nanašajo na samooceno priložnosti za usvajanje globalnih kompetenc v šoli ne glede na srednješolski izobraževalni program, ki ga obiskujejo učenci in učenke.

Rezultati odpirajo več vprašanj o organizaciji in vsebini učenja globalnega državljanstva v programih srednjega poklicnega izobraževanja v Sloveniji. Postavlja se vprašanje kakovosti priložnosti za usvajanje globalnih kompetenc, za katere je na podlagi rezultatov prispevka mogoče trditi, da je njihova učinkovitost omejena. Rezultati prav tako postavljajo pod vprašaj kompenzacijsko vlogo programov srednjega poklicnega izobraževanja pri razvoju globalnih kompetenc učencev in učenk. Upoštevajoč raziskave, da je socialno-ekonomski status pomemben individualni dejavnik pri usvajanju globalnih kompetenc (npr. Smith idr., 2017), tudi v Sloveniji, in da so v programe srednjega poklicnega izobraževanja v Sloveniji vključeni učenci in učenke z nižjim socialno-ekonomskim statusom kot v gimnazijske programe, je mogoče trditi, da programi srednjega poklicnega izobraževanja v Sloveniji ne kompenzirajo tega individualnega dejavnika in deprivilegiranim učencem in učenkam ne omogočajo, da bi globalne kompetence uspešno razvijali v šoli.

Prispevek prikazuje, da tako kot na področju temeljnih kompetenc (bralna, matematična, naravoslovna pismenost), tudi na področju globalnih kompetenc zagotavljanje enakih možnosti in s tem pravičnosti ostaja eden izmed pomembnih izzivov slovenskega izobraževalnega sistema (prim. Cankar et al., 2017; Šterman Ivančič in Štremfel, 2020). Identificirane razlike v globalnih kompetencah učencev in učenk v programih gimnazijskega in srednjega poklicnega izobraževanja podpirajo idejo (npr. Demaine, 2002), da globalne kompetence osvetljujejo (ne)enakost in (ne)pravične možnosti državljanov znotraj nacionalnih držav.

Rezultati implicirajo, da je treba pri načrtovanju učinkovitih priložnosti za usvajanje globalnih kompetenc v šoli upoštevati individualno ozadje učencev in učenk, kot sta socialno-ekonomski status in akademske sposobnosti (Van de Werfhorst, 2017). V razpravah o prihodnosti srednjega poklicnega izobraževanja je pomembno poudariti, da ta ne zasleduje le cilja zaposljivosti, temveč tudi razsežnost aktivnega državljanstva, pri tem pa tudi v poklicnih programih krepiti temeljno znanje o globaliziranem svetu. Raziskave (npr. Dijkstra idr., 2021) kažejo, da je slednja dimenzija v programih srednjega poklicnega izobraževanja pogosto prezrta, a ključna za razvoj vseh drugih vrlin sodobnih globalnih državljanov (spretnosti, stališč, vrednot) (Štremfel in Šterman Ivančič, 2022). Kot poudarjajo Nylund in drugi (2020) bi morale biti priložnosti za usvajanje globalnih kompetenc v srednjem poklicnem izobraževanju zagotovljene ne le pri splošnih, temveč tudi poklicnih predmetih, saj imajo ti enake dispozicije za učenje globalnega državljanstva. Kot taki bi programi srednjega poklicnega izobraževanja uspešneje izpolnjevali svojo kompenzacijsko vlogo pri razvoju globalnih kompetenc vseh, tudi deprivilegiranih učencev in učenk.

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Dr. Urška Štremfel, znanstvena sodelavka na Pedagoškem inštitutu v Ljubljani, Slovenija.
E-mail: urska.stremfel@pei.si

Dr. Klaudija Šterman Ivančič, znanstvena sodelavka na Pedagoškem inštitutu v Ljubljani, Slovenija.
E-mail: klaudija.sterman@pei.si

Student Engagement in Distance Learning

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KLJUČNE BESEDE: vedenjska angažiranost, čustvena angažiranost, kognitivna angažiranost, pristop k študiju, študenti, študij na daljavo

POVZETEK – Angažiranost študentov pri študiju smo proučevali na podlagi modela, ki vključuje tri dimenzije angažiranosti: vedenjsko, čustveno in kognitivno. V raziskavi smo želeli ugotoviti, kako se pristop k študiju na daljavo med pandemijo covid-19 povezuje z drugimi elementi posamezne dimenzije angažiranosti študenta. V vzorec je bilo zajetih 1167 študentov Univerze v Ljubljani. Uporabili smo deskriptivno metodo raziskovanja. Hipoteze smo preverjali s Spearmanovimi rho-koeficienti, ki so potrdili obstoj statistično značilnih povezanosti med pristopom k študiju in drugimi elementi angažiranosti. Študentje, ki bolj aktivno in poglobljeno pristopajo k študiju, so pri študiju bolj angažirani vedenjsko, čustveno in kognitivno. Potrjene raziskovalne hipoteze potrjujejo tudi povezanost med različnimi dimenzijami angažiranosti in s tem doprinašajo uvid v večplastnost manifestacij angažiranosti študentov. Ugotovitve lahko predstavljajo podlago za ustvarjanje didaktičnih modelov, ki podpirajo angažiranost študentov z aktivnostmi, ki spodbujajo aktiven in poglobljen študij, ne glede na okoliščine in obliko izvedbe študija.

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KEYWORDS: behavioural engagement, emotional engagement, cognitive engagement, study approach, students, distance learning

ABSTRACT – Student engagement in distance learning was studied based on a model that includes three dimensions of engagement: behavioural, emotional and cognitive. In this study, the author aimed to ascertain how the approach to distance learning during the COVID-19 pandemic related to the other elements of each dimension of student engagement. The sample consisted of 1,167 students from the University of Ljubljana. A descriptive research method was used. Hypotheses were tested using Spearman's rho coefficients, which confirmed the presence of statistically significant correlations between the study approach and other elements of engagement. Students who study more actively and in depth are more behaviourally, emotionally, and cognitively engaged in their studies. The validated research hypotheses also confirm the correlations between the different dimensions of engagement, thus providing insights into the multiple manifestations of student engagement. The findings can serve as a basis for developing didactic models that support student engagement through activities that promote active and in-depth learning, regardless of the context or mode of delivery of studies.

1 Introduction

Engagement refers to initiative, enthusiasm, optimism, curiosity and interest in activities. Disengagement is manifested by passivity, willingness to exert little effort in the face of challenges, boredom, despair, anxiety and anger (Skinner and Belmont, 1993). In existing research, the concept of engagement has been described as a multidimensional metaconstruct (Fredricks et al., 2004; Lawson and Lawson, 2013) that encompasses a range of indicators related to various environmental, attitudinal and learning activity factors (Bond and Bedenlier, 2019). Thus, it is not an isolated phenomenon, but rather a dynamic, social and synergistic process that represents a complex interaction between individuals and their social environment (Fredricks et al., 2004; Lawson and Lawson, 2013). The way a student engages in study and the interest they show in it (Axelson and

Flick, 2010; Chapman, 2002) depends on their social circumstances (Kahu, 2013). The value of considering a student's social circumstances in terms of their engagement in their studies is that it can contribute to understanding the student's agency in the context of their position in individual circumstances and the characteristics of the time. A model that considers context and various environmental systems, and takes a holistic approach to the research of student engagement has gained traction in recent decades with contributions from a few individual studies (Bond and Bedenlier, 2019; Lawson and Lawson, 2013). This model understands student engagement in relation to an individual's varied and current circumstances, and contributes to an understanding of student engagement on a continuum from engagement to disengagement (Bond and Bedenlier, 2019). The model includes three basic forms or dimensions of student engagement, i.e., behavioural, emotional and cognitive, to highlight the multifaceted nature of the phenomenon of student engagement, which manifests itself simultaneously in students' behaviour, emotions and ways of thinking (Fredricks et al., 2004). Behavioural engagement is manifested in visible behaviours, such as students' participation in and active response to academic activities, such as studying. Emotional engagement refers to the emotional response to learning activities and the learning environment, and is manifested in interests, values, emotions, students' sense of well-being in the classroom, satisfaction, identification with the study programme and faculty, sense of belonging and connectedness with others. Cognitive engagement, for example, is demonstrated by readiness and flexibility in problem solving, constructive overcoming of challenges, reflection, motivation, and in-depth learning (Bond and Bedenlier, 2019; Bond et al., 2020; Chapman, 2002; Fredricks et al., 2004; Salas-Pilco et al., 2022). Those authors (Bond and Bedenlier, 2019; Bond et al., 2020), who emphasise the digitised environment in this model and pose the topical question of how to foster student engagement in the digital age, set the stage for researching and understanding student engagement in distance learning during the COVID-19 pandemic (Rossi et al., 2021). Distance learning behavioural engagement is when a student actively participates in distance learning activities; emotional engagement is when a student expresses and demonstrates a positive attitude toward the distance learning environment; and cognitive engagement is when a student is motivated to learn in distance learning (Salas-Pilco et al., 2022).

Students usually differ in whether they use a surface or a deeper learning approach (Cvetek, 2015; Solomonides, 2013; Šarić and Košir, 2012). Depending on the learning approach, students' engagement in learning also varies. The surface learning approach is characterised by students absorbing information passively and uncritically, focusing only on the requirements of the exam, and memorising and reproducing content. A deep learning approach is characterised by students attempting to understand the material, interacting with the content, connecting new ideas to existing knowledge and experiences, making judgments and drawing conclusions based on evidence (Cvetek, 2015; Solomonides, 2013).

In a study of active learning in distance learning during the COVID-19 pandemic, Rossi et al. (2021) conclude that the use of active learning tools in the classroom that require continuous student engagement benefits students and improves their critical thinking. A study by Perić Prkosovački et al. (2020) "demonstrated the need to build a pedagogy of learning – a pedagogy that will enable learners to learn" (p. 51). However, active teaching is inconceivable without student activity and their response to teacher

activity in their teaching approach (Perić Prkosovački et al., 2020). “This means that students are expected to work intensively intellectually, to seek and discover new solutions, in short, to be creative” (Perić Prkosovački et al., 2020, p. 54). In a departure from traditional didactic models, the teacher applies active teaching methods and the student must be willing to engage in active learning (Rossi et al., 2021). “By promoting self-directed, independent learning, the responsibility for learning is transferred from the teacher to the students” (Koprivnik and Hus, 2017, p. 118). Without paying attention to students’ activity, it is almost impossible to relate their academic achievement to classroom activities (Kuh, 2001). According to Buljubašić Kuzmanović and Gazibara (2016), “the evaluation of active learning in higher education teaching, /.../, indicates the unity of the processes of learning and teaching, their interdependence and complementarity” (Buljubašić Kuzmanović and Gazibara, 2016, p. 119). A common premise of diverse teaching approaches is “to require students to take an active role and responsibility for their studies” (Šarić and Košir, 2012, p. 137). Even in circumstances such as the COVID-19 pandemic, which fundamentally changed normal living conditions, it is necessary to emphasise the aspect of responsibility towards studies, as pointed out by Žgur and Jerman (2022). This is because the responsibility for the quality of learning is shared between the teaching approach and student engagement (Axelson and Flick, 2010; Rossi et al., 2021). The learning process “can also be influenced by students’ personal experiences and their own experience, as well as by the way they relate to others and the quality of their contact with them” (Žgur and Jerman, 2022, p. 53). The findings of this study contribute to a better understanding of student engagement in learning in the context of a pandemic and offer insights into the students’ share of responsibility for the quality of learning.

The main goal of this study is to find out how engaged students are in distance learning and how actively and in depth they study during a pandemic situation. The results can serve as a basis for developing didactic models that support students’ engagement in their studies, regardless of the circumstances and the form in which the study is conducted. Based on the goal of the research and the findings of previous authors (Fredricks et al., 2004; Salas-Pilco et al., 2022), the author of this study posed a basic research question: how did the distance learning approach relate to other elements of each dimension of student engagement during the COVID-19 pandemic? The aim is to gain deeper insights into the characteristics of an active and in-depth approach to studying. Thus, the author also posited three research hypotheses:

- H1: There is a statistically significant correlation between an active study approach and an in-depth study approach in distance learning during the COVID-19 pandemic.
- H2: There is a statistically significant correlation between an active study approach and satisfaction with distance learning during the COVID-19 pandemic.
- H3: There is a statistically significant correlation between an in-depth study approach and satisfaction with distance learning during the COVID-19 pandemic.

2 Methodology

Research sample

The purposive sample consisted of 1,424 students from the University of Ljubljana from all regions of Slovenia. The study included 1,167 students, who answered the questions about the topic of studies partially or completely. Of these, 79.4% were female and 20.6% were male. Exactly half of the students were from urban areas and the other half from rural areas. Social science and humanities students dominated (77.6%), most of whom (90%) were enrolled in first-level degree programmes. Some respondents did not answer all the questions, so the number of respondents in the results may differ due to missing values that were not substituted.

Procedure and instrument

The data were collected as part of cross-sectional research titled “The Position of Students of the University of Ljubljana under COVID-19 Conditions”, which was conducted at the Department of Social Pedagogy of the Faculty of Education of the University of Ljubljana. The research followed the quantitative method of data collection and used a descriptive research method. The data were collected using the online application lka.si. The questionnaire, which was specifically designed for this purpose and based on single items, included demographic questions and several topics related to the students’ situation during the COVID-19 pandemic. Prior to conducting research, the questionnaire was tested for content comprehensibility, and, based on the feedback, the weaknesses were eliminated. The participants took part in the survey anonymously and voluntarily. They were informed before starting the survey that they were free to cease participating at any time.

For the purposes of this study, the data relating to the topic of studies were relevant. The questions were designed to cover several dimensions of student engagement, i.e., behavioural, emotional and cognitive engagement. Students were asked how satisfied they were with distance learning, which they rated on a four-point scale (1 – Very Dissatisfied, 2 – Dissatisfied, 3 – Satisfied, 4 – Very Satisfied). Five additional questions were asked to assess the students’ other responses to distance learning, two of which contained multiple items. Using a four-point scale (1 – Never, 2 – Rarely, 3 – Frequently, 4 – Regularly), students indicated how often the items applied to them (e.g., “I participate in discussions in my distance learning classes.”). For three questions, students indicated which answer applied to them (e.g., “I am more/equally/less present in distance learning compared to learning at my faculty prior to the pandemic.”). Students were also asked whether they felt connected to other students during distance learning and whether they felt optimistic and confident about the future. Using a four-point scale (1 – Not True, 2 – Mostly Not True, 3 – Mostly True, 4 – Absolutely True), students indicated the extent to which they thought the item applied to them (“I felt connected to other students during distance learning.”), and on a four-point scale (1 – Never, 2 – Rarely, 3 – Frequently, 4 – Regularly) indicated how often the item applied to them (“I felt optimistic and confident about the future during distance learning.”).

Data analysis

The collected data were analysed using the IBM Statistics SPSS 26.0 statistical program. Descriptive statistics (the percentages of each response, the mean, and the standard deviation) were calculated. The Spearman's rho coefficient was used for the correlations between the variables, according to the level of measurement of the variables (ordinal variables) and the distribution of responses that deviated from normality.

3 Results

Table 1 shows the mean scores of the responses to each item reflecting the behavioural, emotional and cognitive dimensions of student engagement in distance learning.

Table 1

Dimensions of Engagement with the Elements of Engagement Studied and Descriptive Statistics of the Study Variables

<i>Dimensions of engagement</i>	<i>Elements of engagement</i>	<i>N</i>	<i>M</i>	<i>SD</i>
Behavioural	Takes an active approach to DL ¹	1,164	1.66	0.78
	Presence during DL (less than before) ¹	1,150	2.19	0.74
	Listens during DLC but does not speak	1,150	3.11	0.83
	Participates in discussions during DLC	1,153	2.24	0.91
	Participates in activities during DLC	1,152	2.39	0.95
	Only logs in to DLC but does not listen, does other things	1,153	2.12	0.80
	Has a camera on during DLC	1,155	2.14	0.90
	Digital literacy (insufficient for DL)	1,121	1.60	0.71
Emotional	Satisfaction with DL	1,167	2.49	0.92
	Feels connected with other students (experiences connectedness during DL)	1,118	2.00	0.90
Cognitive	Motivation to study (lower than prior to DL)	1,113	3.13	1.02
	Student effectiveness (worse than prior to DL)	1,112	2.95	1.07
	Experiences optimism and confidence about the future	909	2.12	0.64
	Takes an in-depth approach to DL ¹	1,164	1.66	0.76

Note. N – numerus, M – mean, SD – standard deviation, DL – distance learning, DLC – distance learning classes. ¹ The minimum and maximum expression values for the item were 1 and 3; for the other items, they were 1 and 4.

The results show that over half of all students who participated in the study took a less active (52.6%) and less in-depth (51.5%) approach to distance learning than prior to the pandemic. Less than one-fifth of participating students took a more active (18.8%) and more in-depth (17.9%) approach to their studies than prior to the pandemic. The remainder indicated that their approach to studying did not change during the pandemic. In terms of their presence during distance learning classes, 39% of all the research participants indicated that they were less present, 20% were more present, and 41% were present to the same extent as prior to the pandemic. The results show that, on average (Table 1), the participating students most often (36.9% regularly and 40.4% frequently) only listened but did not speak during distance learning classes. On average, they participated significantly less in discussions and activities (Table 1). Only 12% of the participating students participated in discussions regularly and 20.4% frequently, while two-thirds participated rarely (47.3%) or never (20.4%). A slightly higher number of students participated in activities regularly (15.5%) and frequently (25.8%), but still more than half did so rarely (40.6%) or never (18.1%). Nearly one-third of the participating students (23.8% frequently and 5.2% regularly) logged into distance learning classes while doing other things. Similarly, nearly one-third had their camera on regularly (8.7%) or frequently (22.3%) during distance learning classes, and over two-thirds rarely (43%) or never (26.1%). Analysis of the results also shows that only 7.7% of respondents felt they frequently experienced a lack of digital literacy for distance learning, and only 1.9% regularly.

In terms of satisfaction with distance learning, participants' responses were split fairly equally between satisfied and dissatisfied, with slightly more than half (53.3%) of all research participants indicating that they were satisfied (40.7%) or very satisfied (12.6%) with distance learning, and slightly less than half (46.7%) indicating that they were dissatisfied (29.6%) or very dissatisfied (17.1%). The results also show that less than one-third of participating students indicated that it was mostly (22%) or absolutely (6%) true that they felt connected to other students during distance learning, while for just over two-thirds of participants, this was mostly not true (34%) or not true at all (37%).

In addition, the results show that almost 74% of the participants indicated that they were regularly (49.5%) or frequently (24%) less motivated to learn during distance learning than prior to the pandemic. However, more than 65% of participants reported that, during distance learning, their study efficiency was worse regularly (42.5%) or frequently (22.7%) than prior to the pandemic. When asked how often they experienced optimism and confidence about the future during distance learning, the most common response was rarely (64%). A further 21% experienced optimism and confidence about the future frequently, 2% regularly and 13% never.

The results in Table 2 show statistically significant correlations between approach to studying and other elements of engagement.

Table 2

Statistically Significant Correlation between Approach to Studying and Other Elements of the Engagement Variable

<i>Dimensions of engagement</i>	<i>Elements of engagement</i>	<i>Approach to studying</i>	
		<i>An active approach</i>	<i>An in-depth approach</i>
Behavioural	Takes an active approach to DL ¹		0.747**
	Presence during DL (less than before) ¹	-0.504**	-0.429**
	Listens during DLC but does not speak	0.014	-0.009
	Participates in discussions during DLC	0.321**	0.270**
	Participates in activities during DLC	0.367**	0.330**
	Only logs in to DLC but does not listen, does other things	-0.338**	-0.317**
	Has a camera on during DLC	0.190**	0.172**
Emotional	Digital literacy (insufficient for DL)	-0.058	-0.100**
	Satisfaction with DL	0.523**	0.490**
Cognitive	Feels connected with other students (experiences connectedness during DL)	0.330**	0.294**
	Motivation to study (lower than prior to DL)	-0.570**	-0.576**
	Student effectiveness (worse than prior to DL)	-0.591**	-0.604**
	Experiences optimism and confidence about the future	0.173**	0.154**
	Takes an in-depth approach to DL ¹	0.747**	

Note. DL – distance learning, DLC – distance learning classes. ¹ The minimum and maximum expression values for the item were 1 and 3; for the other items, they were 1 and 4. ** Statistically significant at the 0.01 level.

The hypotheses were tested by calculating Spearman's rho coefficients between an active study approach and an in-depth study approach to distance learning, satisfaction with distance learning, and between an in-depth study approach and satisfaction with distance learning. These results are shown in bold in Table 2. The results confirm H1: There is a statistically significant correlation between an active study approach and an in-depth study approach in distance learning during the COVID-19 pandemic. The results show a statistically significant, positive and strong correlation between active and in-depth approaches to distance learning. The results also confirm H2: There is a statistically significant correlation between an active study approach and satisfaction with distance learning during the COVID-19 pandemic. The results show a statistically significant, positive, medium-strong correlation between an active study approach and satisfaction with distance learning. H3 is also confirmed: There is a statistically significant correlation between an in-depth study approach and satisfaction with distance learning during the COVID-19 pandemic. The results show a statistically significant,

positive, medium-strong correlation between an in-depth study approach and satisfaction with distance learning. As can be seen in Table 2, the results also show statistically significant correlations between the other elements of the behavioural dimension of engagement and the approach to studying. Only two elements of the behavioural dimension of engagement with regard to the active approach to studying, as well as one element of the behavioural dimension of engagement with regard to the in-depth approach to distance learning, did not show statistically significant correlations. The elements of the emotional and cognitive dimensions of engagement were all statistically significantly correlated with an active and an in-depth approach to distance learning. Analysis of the results, taking into consideration all the elements of each engagement dimension, shows that the statistically significant correlations between the emotional dimension of engagement and the approach to distance learning, as well as between the cognitive dimension of engagement and the approach to distance learning, were stronger than between the behavioural dimension of engagement and the approach to distance learning.

4 Conclusions

The findings of this study shed light on and contribute to a better understanding of student engagement in distance learning during the COVID-19 pandemic. The individual elements of engagement examined allow a more detailed look at all three dimensions of engagement. Based on the results, it can be concluded that the elements of each engagement dimension reflect the characteristics of the participating students in terms of their study engagement and study experience during the COVID-19 pandemic. At the same time, based on the response rates for each engagement element, it can be summarised that the participating students approached and experienced their studies differently, which may also indicate the importance of other contextual factors in relation to students' study engagement. It should not be overlooked that roughly equal proportions of students reported satisfaction and dissatisfaction with distance learning, or that roughly equal proportions of students reported worse study efficiency than prior to the pandemic and a lack of optimism and confidence about the future during distance learning. In a global study of students from 62 countries ($N = 30,383$), Aristovnik et al. (2020) examined the impact of the COVID-19 pandemic on students' studies and daily lives and found that motivation decreased significantly as a result of studying in social isolation, which posed a number of challenges for students. Nearly 43 % of students who participated in the study reported that they were worried about their future careers most or all of the time (Aristovnik et al., 2020). Other studies have also found that students are uncertain and worried about the future during distance learning (Cleofas, 2021; Kerč et al., 2021). Al-Maskari et al. (2022) point out the phenomenon of an increase in social worries and concern about academic success. According to the authors (Al-Maskari et al., 2022), this worry has a significant impact on individuals' behaviour. Pokhrel and Chhetri (2021) note that many students did not participate in their studies during the COVID-19 pandemic precisely because of their distress. Teacher support has been shown to be crucial in reducing worry (Pokhrel & Chhetri, 2021). Emotional support from teachers is important in promoting emotional engagement and also affects the

effectiveness of learning (Salus-Pilco et al., 2022). Means and Neisler (2021) found that the greatest motivational challenge for students ($N = 1,008$) in distance learning during the COVID-19 pandemic was to continue to perform well in the new form of learning. In courses where teachers sent students personal messages about their performance, it was significantly easier for students to remain motivated. Doolan et al. (2021) found that among European students ($N = 9,196$), those students who had fewer worries in general, i.e., finance, health, dealing with anxiety and studying, were also more satisfied with their studies. As the correlation of student engagement with other circumstances has already been highlighted, satisfaction with studying also depends on an individual's situation (Aristovnik et al., 2020). The COVID-19 pandemic was a challenging time for students. In addition to coping with the unknown and the uncertain, they were also tested in their study engagement.

The exploratory focus of this study on the relationship between study approaches and other elements of each dimension of student engagement contributes to previous knowledge about student engagement. It offers insights into students' share of responsibility for the quality of learning, sheds more light on their approaches to studying, and opens up considerations of the importance of the less visible elements of student engagement to their approaches to studying. It also raises the question of how these elements can be identified and strengthened in the delivery of studies. Students who take a more active and in-depth approach to their studies are more behaviourally, emotionally and cognitively engaged in their studies. The strength of the correlations between the other elements of each dimension of engagement and approach to studying could be interpreted to mean that students' behavioural responses to studying are only partially indicative of their approach to studying, and that their emotional and cognitive responses may be more important to their approach to studying. Based on these findings, it can be concluded that student engagement is a complex phenomenon, which is consistent with the basic research in the field (Fredricks et al., 2004; Lawson and Lawson, 2013). The validated research hypotheses also confirm the correlations between the different dimensions of engagement, thus providing an insight into the multiple manifestations of student engagement, both through behaviour, emotion and thinking (Fredricks et al., 2004). The individual dimensions of engagement and their elements show how actively and in depth students approach their studying. Students' self-assessments of how actively and in depth they approached distance learning shed more light on their approaches. Bradford et al. (2016), in examining behavioural and emotional engagement, found that students who came to a learning session prepared were more active. However, emotional engagement was higher among students who found support in class, were successful, and were motivated by incentives. These findings are also consistent with the study by Cole et al. (2021) confirming that students who are more active in learning are also more engaged in their study activities. In the present study, a more active and in-depth approach to studying was found among students who reported being present during distance learning more than prior to the pandemic, who participated more frequently in discussions and activities in classes, and who had the camera turned on more often during classes. A less active and in-depth approach to studying was found among students who reported only logging into distance learning classes, not listening, and doing other things during the classes. A less in-depth approach to studying was also found among students who indicated that they tended to not have the digital skills for distance

learning. Although the participating students indicated that, on average, they mostly just listened and did not speak during their distance learning classes, no statistically significant correlations were found between this element of the behavioural dimension of engagement and approach to studying. In addition, a more active and in-depth approach to studying was found among those students who reported being more satisfied with their distance learning; who were more likely to feel connected to other students; who were less likely to experience lower study motivation and worse study efficiency during distance learning than prior to the pandemic; and who were more likely to feel optimistic and confident about the future. The correlation between student engagement and academic performance is supported by the findings of a previous study (Rossi et al., 2021) that students who were more actively engaged in a broader range of activities had better academic performance. Similarly, after reviewing studies across different samples and age groups, Fredricks et al. (2004) have confirmed the correlation between behavioural engagement and academic achievement. A correlation was also found between the need to connect with others and student engagement (Fredricks et al., 2004).

The limitations of this study are that it did not examine the impact on the individual elements of engagement and that of the individual elements of engagement on the study approach. Future research on student engagement in studies should be more complex and include more indicators of each dimension of engagement and contextual factors, which would shed more light on the phenomenon and allow for deeper research. Given the results of this study, it would be interesting to see which dimension of engagement has the greatest impact on the approach to studying and the importance of listening skills in learning. It would be worthwhile supplementing this study with a qualitative approach that would shed even more light on students' individual characteristics and circumstances. The author is also aware of other limitations of this study. These include a gender imbalance in the sample, the item-based measurement instrument used, and the limitations of a quantitative cross-sectional study in exploring such a complex phenomenon as student engagement in learning.

Student engagement in learning, regardless of the form in which it is delivered, should be a central focus of research on student learning approaches, because it provides a deeper understanding of learning as well as a valid basis for selecting didactic activities that promote an active and in-depth approach to learning. As highlighted previously by Lawson and Lawson (2013), exploring student engagement can help to profile a student's activity and study orientation in relation to their life circumstances. As noted in the aforementioned studies (Means and Neisler, 2021; Al-Maskari et al., 2022), interest in and support for students' individual circumstances and concerns contributes to increased student engagement in their studies and is also a preventative measure against disengagement (Lawson and Lawson, 2013). As Fredricks et al. (2004) suggest, engagement research should be strengthened based on the needs of the individual, as this provides an understanding of the individual in their own context. Individual needs, with their diversity, also have different implications for student activities. In the study by Buljubašić Kuzmanović and Gazibara (2016), for example, a quarter of the participating students needed only more time and additional incentives to be actively engaged. As the authors point out (Buljubašić Kuzmanović and Gazibara, 2016), "the fact that some students need a longer time to achieve the set objectives should not be ignored" (p. 126). Addressing different individual needs by adapting to the individual should be

an integral part of the modern educational process. Such factors may not have received much attention prior to the pandemic experience, but have certainly highlighted the importance of knowing and acknowledging individual needs in all their diversity. Didactic orientations to support student engagement in studies must be person-centred while promoting their integration into the group. The responses received in the survey point to these needs. Research on distance learning during the COVID-19 pandemic has provided insights into the field of student engagement in studies that suggest directions for further research in this area, regardless of the form of delivery of the studies. The form of studies itself does not guarantee learning. To effectively support student learning, learning activities must be designed to promote students' behavioural, emotional and cognitive engagement, regardless of the form in which the studies are delivered, taking into account the specific thematic context (Salus-Pilco et al., 2022). Didactic strategies that support student engagement should contribute to positive student experiences in active learning activities, such as participation in activities or discussions (Martin and Bolliger, 2018).

Dr. Nataša Zrim Martinjak

Angažiranost študentov pri študiju na daljavo

Angažiranost študentov pri študiju smo proučevali na podlagi modela, ki vključuje tri dimenzije angažiranosti – vedenjsko, čustveno in kognitivno, s katerimi izpostavlja večplastnost pojava angažiranosti. Ta model angažiranost študenta razume v soodvisnosti od posameznikovih raznolikih in aktualnih okoliščin. Prispevek naslanjamo na zanimanje glede angažiranosti študenta pri študiju na daljavo med pandemijo covid-19. O vedenjski angažiranosti pri študiju na daljavo govorimo, ko študent aktivno sodeluje pri študijskih aktivnostih na daljavo; o čustveni angažiranosti, ko študent izraža in pokaže pozitivna stališča do učnega okolja na daljavo; o kognitivni angažiranosti pa, ko je študent motiviran za učenje na daljavo (Salus-Pilco idr., 2022). Študentje se pri učenju najpogosteje razlikujejo v tem, ali uporabljajo površinski ali globinski pristop k učenju (Cvetek, 2015; Solomonides, 2013; Šarić in Košir, 2012). Glede na pristop k učenju je različna tudi angažiranost študenta pri študiju. Rossi idr. (2021) v raziskavi o aktivnem učenju pri študiju na daljavo med pandemijo covid-19 ugotavljajo, da uporaba aktivnih učnih orodij pri poučevanju, ki zahtevajo stalno angažiranost študenta, tem koristi in izboljšuje njihovo kritično mišljenje. Vendar pa si, brez aktivnosti in odzivnosti študenta na učiteljevo dejavnost v njegovem poučevalnem pristopu, aktivnega poučevanja ni mogoče predstavljati (Perić Prkosovački idr., 2020). Učitelj v odmiku od tradicionalnih didaktičnih modelov uporablja aktivne metode poučevanja, študent pa mora biti pripravljen sodelovati z aktivnim učenjem (Rossi idr., 2021). Skupna zahteva raznolikih poučevalnih pristopov je, "da od študenta zahtevajo, da sam prevzame aktivno vlogo in odgovornost pri študiju" (Šarić in Košir, 2012, str. 137). Tudi v okoliščinah, kot je pandemija covid-19, ki je temeljito preoblikovala običajne razmere življenja, je potrebno izpostaviti vidik odgovornosti do študija, poudarjata Žgur in Jerman (2022). Odgovornost za kakovost učenja se namreč deli med poučevalni pristop in angažiranost študenta (Axelson in Flick, 2010; Rossi idr., 2021). Rezultati pričujoče raziskave prina-

šajo večje razumevanje angažiranosti študenta pri študiju v pandemskih okoliščinah in nudijo vpogled v študentov del odgovornosti za kakovost učenja. Temeljni cilj raziskave je bil ugotoviti, kakšna je angažiranost študenta pri študiju na daljavo ter kako aktivno in poglobljeno je pristopal k študiju v pandemični situaciji? Zastavili smo si raziskovalno vprašanje, kako se pristop k študiju na daljavo med pandemijo covida-19 povezuje z drugimi elementi posamezne dimenzije angažiranosti študenta?

S pomočjo spletnega orodja za anketiranje smo podatke zbirali v okviru širše pre-sečne raziskave z naslovom "Položaj študentov in študentk Univerze v Ljubljani v raz-merah covida-19", ki smo jo izvedli na Oddelku za socialno pedagogiko Pedagoške fakultete Univerze v Ljubljani. Anketni vprašalnik je bil oblikovan prav za ta namen in je temeljil na posameznih postavkah. Poleg demografskih vprašanj je obsegal več tematskih področij, vezanih na položaj študentov v razmerah covida-19. Za pričujočo raziskavo je bil relevanten del podatkov iz študijskega tematskega področja. Oblikovali smo vprašanja, ki so se navezovala na različne dimenzije angažiranosti študenta – na vedenjsko, čustveno in kognitivno angažiranost. V analizo smo zajeli 1167 študentov, ki so delno ali v celoti odgovorili na študijsko tematsko področje. Od teh jih je bilo 79,4 % ženskega spola in 20,6 % moškega spola. Natanko polovica udeležencev je prihajala iz mestnega, druga polovica iz podeželskega okolja. Večina je bilo študentov družbo-slovnih in humanističnih smeri (77,6%), od vseh jih je bilo največ (90%) vpisanih v programe prve stopnje.

Uporabili smo deskriptivno metodo raziskovanja. Na podlagi rezultatov smo ugo-tovili, da elementi posamezne dimenzije angažiranosti pokažejo značilnosti udeleženih študentov v njihovem študijskem delovanju in doživljanju študija med pandemijo covi-da-19. Ob tem, na podlagi deležev odgovorov pri posameznem elementu angažiranosti, lahko povzamemo, da so udeleženi študentje k študiju različno pristopali in ga tudi različno doživljali, iz česar bi lahko sklepali tudi na pomen drugih okoliščin pri an-gažiranosti študenta pri študiju. Nekatere predhodne raziskave (Aristovnik idr., 2020; Cleofas, 2021; Kerč idr., 2021; Al-Maskari idr., 2022) ugotavljajo vplive pandemije covida-19 na študijsko in vsakdanje življenje študentov ter povečanje skrbi in stisk med študenti, zaradi katerih mnogi študentje niso bili angažirani pri študiju (Pokhel in Ch-hetri, 2021).

Hipoteze smo preverjali s Spearmanovimi rho-koeficienti. Rezultati so potrdili, da med aktivnim pristopom k študiju in poglobljenim pristopom k študiju na daljavo med pandemijo covida-19 obstajajo statistično značilne povezanosti. Prav tako so rezultati potrdili, da statistično značilne povezanosti obstajajo med aktivnim pristopom k študiju in zadovoljstvom s študijem na daljavo med pandemijo covida-19 in tudi med pogloblje-nim pristopom k študiju in zadovoljstvom s študijem na daljavo med pandemijo covi-da-19. Študentje, ki bolj aktivno in poglobljeno pristopajo k študiju, so bolj angažirani pri študiju, tako vedenjsko, čustveno kot tudi kognitivno. Analiza rezultatov je, ob upo-števanju vseh proučevanih elementov posamezne dimenzije angažiranosti, pokazala, da so statistično značilne povezanosti močnejše jakosti med čustveno dimenzijo angažira-nosti in pristopom k študiju na daljavo ter med kognitivno dimenzijo angažiranosti in pristopom k študiju na daljavo, kot pa med vedenjsko dimenzijo angažiranosti in pristo-pom k študiju na daljavo. To bi si lahko razlagali s tem, da vedenjski odzivi študenta pri študijski izvedbi le deloma pokažejo njegov pristop k študiju ter da bi lahko bili njegovi emocionalni in kognitivni odzivi pomembnejši za njegov pristop k študiju. Da je angaži-

ranost študentov kompleksen pojav, zaključujemo tudi na podlagi naslednje ugotovitve, ki je skladna s temeljnimi raziskavami področja (Šimec idr., 2022, Lawson in Lawson, 2013). Potrjene raziskovalne hipoteze potrjujejo tudi povezanost med različnimi dimenzijami angažiranosti in s tem doprinašajo uvid v večplastnost manifestacij angažiranosti študentov. Posamezne dimenzije angažiranosti in njihovi elementi nakazujejo na to, kako aktivno in poglobljeno študent pristopa k študiju. Ob študentovi samooceni tega, kako aktivno in poglobljeno so pristopali k študiju na daljavo, o tem razkrivajo več oz. ga natančneje osvetlijo. Bolj aktiven in bolj poglobljen pristop k študiju smo ugotovili pri tistih študentih, ki so poročali, da so bili pri študiju na daljavo prisotni več kot prej, tistih, ki so bolj pogosto sodelovali v diskusijah in aktivnostih pri študijskih urah, tistih, ki so imeli pri študijskih urah bolj pogosto prižgano kamero, pri tistih, ki so poročali, da so bili bolj zadovoljni s študijem na daljavo, tistih, ki so pogosteje doživljali povezanost z drugimi študenti, se manj pogosto soočali s slabšo motivacijo za študij in študijsko učinkovitostjo med študijem na daljavo kot prej, ter pri tistih, ki so pogosteje doživljali optimizem in zaupanje v prihodnost. Manj aktiven in poglobljen pristop k študiju pa smo ugotovili pri tistih študentih, ki so poročali, da so se na študijske ure, ki so potekale na daljavo, le prijavili in niso poslušali ter so ob tem delali druge stvari, in pri tistih, ki so poročali, da so se bolj pogosto soočali s pomanjkljivimi digitalnimi spretnostmi za študij na daljavo.

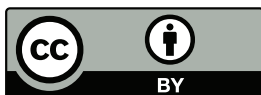
Omejitve naše raziskave so v tem, da ni raziskovala vplivov na posamezni element angažiranosti in vplivov posameznih elementov angažiranosti na pristop k študiju. Glede na rezultate naše raziskave bi bilo zanimivo preveriti, katera dimenzija angažiranosti najbolj vpliva na pristop k študiju. Zavedamo se tudi drugih omejitev naše raziskave, kot so neuravnoteženost vzorca po spolu, uporabljen merski instrument, ki temelji na posameznih postavkah, prav tako pa kvantitativna presečna raziskava omejuje raziskovanje tako kompleksnega pojava, kot je angažiranost študentov pri študiju.

Zagotovo pa raziskava z ugotovitvami ob raziskovalnem osredotočanju na povezanost med pristopom k študiju in drugimi elementi posamezne dimenzije angažiranosti študenta doprinaša k predhodnim spoznanjem o angažiranosti študenta (Blažič, 2021). Prispeva vpogled v študentov del odgovornosti za kakovost učenja, natančneje osvetljuje njegov pristop k študiju in odpira premisleke o pomenu manj vidnih elementov angažiranosti študenta za njegov pristop k študiju. Nadalje zastavlja izzive, kako jih pri študijski izvedbi prepoznati in jih krepiti. Ugotovitve lahko predstavljajo podlago za ustvarjanje didaktičnih modelov, ki podpirajo angažiranost študentov z aktivnostmi, ki spodbujajo aktiven in poglobljen študij. Didaktične usmeritve v podporo angažiranosti študentov pri študiju morajo biti osredinjene na posameznika in hkrati spodbujati njegovo vključenost v skupino. Dobljeni odgovori nakazujejo na te potrebe. Pandemija covid-19 je pokazala na vplive aktualnih okoliščin tako na vsakdanje kot študijsko življenje študentov. Raziskovanje študija na daljavo je prispevalo uvide v področje angažiranosti študenta pri študiju, ki dajejo usmeritve nadaljnjemu raziskovanju področja, ne glede na obliko izvedbe študija. Sama oblika izvedbe študija namreč še ne zagotavlja učenja. Ob posvečanju pozornosti posameznikovim aktualnim okoliščinam so, ne glede na obliko izvedbe študija, učne dejavnosti tiste, ki morajo podpirati tako vedenjsko, čustveno kot kognitivno angažiranost študenta.

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Artificial Intelligence in the Educational Context: Value and Challenges

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KLJUČNE BESEDE: umetna inteligenca, izobraževanje, učitelj, inovacije

IZVLEČEK – Izobraževanje in izobraževalne ustanove so v zadnjih letih doživele številne spremembe, predvsem zaradi razvoja novih tehnologij. Ugotovitve relevantnih raziskav kažejo, da uvedba umetne inteligence v izobraževalni proces vpliva na izboljšanje šolskega uspeha učencev. Uporaba umetne inteligence v izobraževanju je prispevala k razvoju učinkovitosti poučevanja s personaliziranimi pristopi k učenju, ki zagotavljajo edinstveno izkušnjo za vsakega učenca. Prispevek opredeljuje umetno inteligenco v izobraževalnem kontekstu in njene elemente ter predstavlja pomembne rezultate raziskav ter prednosti in slabosti uporabe umetne inteligence v izobraževanju. Namen prispevka je osvetliti pomen tega pojava in njegovo refleksijo v izobraževalni praksi. Kljub nespornim prednostim umetne inteligence je pomembno poudariti, da obstajajo tudi potencialni izzivi, ki jih moramo zaznati, da se lahko nato osredotočimo na njihovo premagovanje.

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KEYWORDS: artificial intelligence, education, teacher, innovations

ABSTRACT – Education and educational institutions have undergone many changes in recent years, mainly due to the development of new technologies. The findings of relevant research indicate that the implementation of artificial intelligence into the educational process affects the improvement of students' achievement. The application of artificial intelligence in education has contributed to the development of teaching efficiency through personalized approaches to learning, providing unique experiences for each student. The paper defines artificial intelligence in the educational context, as well as its elements, along with presenting the significant research results and highlighting the advantages and disadvantages of using artificial intelligence in education. The aim of the paper is to shed light on the importance of this phenomenon and its effect on educational practice. Despite the indisputable benefits of artificial intelligence, it is important to point out that there are also potential challenges that we need to perceive and focus on overcoming.

1 Introduction

The use of artificial intelligence is evident in almost all the spheres of our lives. Artificial intelligence is a technology that transforms all aspects of our social interactions. When it comes to education, artificial intelligence develops new systems and solutions for student learning, but also for educating teachers (Joshi et al., 2021). The implementation of artificial intelligence is a new challenge in the educational process. There are certain obstacles that should be overcome, such as insufficient information for teachers about artificial intelligence, as well as insufficient technological equipment for educational institutions (Atlas, 2023; D'Amico et al., 2023; van Dis et al., 2023; Halaweh, 2023). Artificial intelligence has proven to be a key technology for improving the learning experience because it can personalize the learning process, but it can also automatically analyze student data (Lynch, 2022). This includes a number of meth-

ods and technologies, such as: machine learning, neurolinguistic programming, data research (Tlili and Burgos, 2022).

2 Artificial intelligence in education

There is no universally accepted definition of artificial intelligence. In the educational context, it represents the theory and development of computer systems for performing tasks that require human intelligence, such as: visual perception, speech recognition, decision making and translation from one language to another (Kuleto et al., 2021). Artificial intelligence is the field of study of innovations and developments that have resulted in computers, machines, and other artifacts possessing human-like intelligence (Zhai et al., 2021). Coppin (2004) believes that artificial intelligence is the ability of machines to adapt to completely new situations, answer questions, solve problems, and perform functions typical for humans. Whitby (2008) defines artificial intelligence as the study of intelligent behavior in humans, animals, and machines, as well as the effort to build such behavior into computers and computer technologies. The application of artificial intelligence in education has contributed to the development of teacher efficiency, personalized learning, and implementing better structured contents (Chen et al., 2020). Joshi et al. (2021) believe that the application of artificial intelligence in education is significant for the following reasons:

- Automation process – teachers can increase interaction with students by automating simple tasks through artificial intelligence;
- Integrations – can be integrated with other intelligent technologies;
- Identifications – artificial intelligence will identify priority fields for the student.

An artificial intelligence application can create an individualized curriculum for a student's specific needs. Intelligent Tutoring Systems (ITS) use artificial intelligence techniques to simulate individual teaching, provide learning activities that best suit the learner, and provide timely feedback, all without the teacher's presence (Luckin et al., 2016). Artificial intelligence can translate the teacher's presentation into any language the student chooses. This is particularly important for students with hearing or visual impairments (Joshi et al., 2021). Thus, it could be said that artificial intelligence is being promoted as a strategic value for education (Zhai et al., 2021).

Artificial intelligence can also improve assessment methods in traditional classrooms by providing timely information on the student's learning progress, success, or failure (Sánchez- Prieto et al., 2020). It enables us to determine whether the student has reached the correct answer, at the same time providing the teacher with an insight into the student's actions that have led to the correct answer. Moreover, artificial intelligence can successfully identify students' psychological states, as well as provide support for each individual situation (Kim and Kim, 2022).

3 Overview of relevant research

In the context of this paper, it is important to mention the research by Kim and Kim (2022), which aimed to examine the perception of teachers regarding the implementation of artificial intelligence into the educational process. The results showed that the majority of teachers had a positive perception of artificial intelligence in education (Kim and Kim, 2022).

The research conducted by Paek and Kim (2021) aimed to understand the impact of artificial intelligence on education. Namely, the research was conducted by analyzing international research trends and assessing the direction of future education. The authors derived key research topics and analyzed research trends in the field of artificial intelligence in education, such as changes in research topics. A total of 5,035 papers related to the application of artificial intelligence in education were found in the *Web of Science database*. Over the past 20 years, the number of papers on the implementation of artificial intelligence in education has increased. A particularly rapid increase since 2015 indicates that the impact of artificial intelligence on education is becoming increasingly significant (Paek and Kim, 2021).

A relevant study (Zhao et al., 2019) has shown that the application of artificial intelligence-based teaching is highly correlated with the academic achievement of students. Consequently, students have high achievements in artificial intelligence-based teaching. Moreover, the use of chatbots can help science teaching by improving student learning and performance. Research has shown that the use of artificial intelligence can have a positive impact on the scientific writing of students of natural sciences (Kim and Kim, 2022).

A study by Celik et al. (2022) that investigated the application of artificial intelligence and machine learning methods by teachers showed that artificial intelligence offered teachers several possibilities for effective planning of the teaching process. Namely, through the application of artificial intelligence, teachers could evaluate students more easily. They could provide immediate feedback to students and develop their new roles in teaching.

4 ChatGPT and virtual assistants (robots) in teaching

ChatGPT is a tool based on artificial intelligence that allows generating texts based on user queries. It is designed in a way that it can understand the language and offer relevant answers to the user's questions. It includes a large amount of data, but all models are trained on data up to 2021 (Halaweh, 2023). This technology has the potential to change educational activities in the future. A chatbot called ChatGPT-3 was released last year, and it is evident that this application of artificial intelligence will have huge implications for all aspects of society (Tlili et al., 2023).

What can be seen as a problem with this tool is insufficient user privacy, as data and query searches can be saved (Tlili et al., 2023). ChatGPT can lead to the development of unemployment, but also to a lack of critical thinking and creativity. This tool

is not insightful, hence the content obtained lacks deeper insight, even if it is correctly specified (Tlili et al., 2023). In addition to the above, plagiarism or theft of intellectual property can be a serious drawback (Atlas, 2023; D'Amico et al., 2023; van Dis et al., 2023; Halaweh, 2023). However, experimental research by different authors (Khalil and Er, 2023; Šušnjak, 2022) has shown that ChatGPT creates high-quality results that easily reach plagiarism detection software (Halaweh, 2023). It is free to use, so for now it is available to everyone.

When talking about robots in teaching, opinions differ, and some authors believe that robots will never be able to take over the role of teachers (Toh et al., 2016; Bosede and Cheok, 2018). Still, it may be premature to draw conclusions about what the future holds in terms of robots in the classroom. Robot teachers have many advantages over human teachers. Namely, the ability of machines to process vast amounts of information and use different ways to meet the needs of students highlights another significant area in which artificial intelligence surpasses humans (Bosede and Cheok, 2018). It also refers to the ability of interaction with learners without human emotions getting in the way. Continuously maintaining a team of satisfied teachers is a challenge, but if they are robots, it can be done much cheaper through artificial intelligence, which implies that robots could be a good substitute for teachers (Bosede and Cheok, 2018). In teaching, robots stimulate the interest of teachers as a tool for the development of students' cognitive and social skills. This way of working can offer students practical activities and get them to be active. Educational robotics tends to enhance the learning experience of students by using activities related to technology, robots, virtual objects (Kuleto et al., 2022). Using educational robotics, students can develop an empathic approach to the literary text. A current example of the use of robots in schools is the "Savremena" school from Belgrade. The school has its own teaching assistant, the robot Pepper. This robot can communicate through voice commands, reacting quickly to human emotions. Pepper also has 2D and 3D HD cameras that allow it to see everything in its environment (Kuleto et al., 2022). It is important to emphasize that this robot cannot be used as an independent teacher, but only as a teacher's assistant (Kuleto et al., 2022). Therefore, Pepper's main task is to help teachers more efficiently implement the lesson, but also to make lessons more interesting and accessible for students.

5 The role of the teacher

The evolution of education towards digital education does not imply that people will need fewer teachers in the future (Dillenbourg, 2016; Zakrajšek, 2018; Šimunović, 2021). There should be less speculation that artificial intelligence will replace teachers and a greater focus on the advantages that artificial intelligence offers teachers, and on how these advantages can change the role of teachers in the classroom (Hrastinski et al., 2019). Given the tremendous technological progress, many researchers have addressed this issue (Pedro et al., 2019; Huang et al., 2010; Čepon, 2018; Harl, 2021; Lamerar and Arnab, 2021; Ouyang et al., 2022). In order to develop awareness, competences and teaching skills by using artificial intelligence in education, teachers would have to acquire certain digital skills and abilities that would be crucial for their role of mo-

tivators in teaching based on artificial intelligence. In addition to digital competences, teachers should: understand the characteristics of artificial intelligence in education in order to be able to make decisions more easily; improve their research skills to guide students' learning; develop team spirit and management skills to ensure their interaction with teaching assistants (Bosede and Cheok, 2018). Artificial intelligence can take over some of the tasks that teachers currently perform (assessment, record keeping). That way, teachers could devote more time to more important aspects of teaching (Luckin et al., 2016). Teachers have limited participation in the development of educational systems based on artificial intelligence. Although some studies have employed experienced teachers to train AI algorithms, further efforts are needed to involve a wider population of teachers in the development of such systems (Celik et al., 2022). Teachers' perceptions of artificial intelligence systems in education vary depending on their pedagogical beliefs, teaching experience, and previous experience in using educational technologies, all of which can affect their willingness to adopt new educational technologies (Gilakjani et al., 2013; Kim and Kim, 2022).

6 Advantages and disadvantages of artificial intelligence application in education

Many authors in their research have highlighted the advantages and disadvantages of using artificial intelligence in the educational process (Bhosale et al., 2020; Khanzode, 2020; Chhaya et al., 2020). A main advantage of artificial intelligence is that its decisions are based on facts, not emotions. Moreover, artificial intelligence can enable: greater efficiency compared to humans; performing different functions simultaneously; a high success rate; fewer mistakes in the implementation of tasks; faster resolution of complex situations (Chhaya et al., 2020). The advantage of artificial intelligence in the educational process is the personalization of learning. Namely, personalized learning is an educational approach that aims at customized learning based on the individual needs and strengths of students. In addition, artificial intelligence can help students who need extra support in education. Providing inclusive access to education is a challenge for most countries. Artificial intelligence systems have shown their effectiveness in creating assistance for students with disabilities. Namely, wearable devices that use artificial intelligence can help visually impaired people to read and recognize faces more easily (OECD, 2020). Since 2016, China has had an intelligent speech recognition system that simultaneously converts the spoken language of teachers into text that students can read on a large screen.

In addition to the above advantages, the application of artificial intelligence in education has a number of disadvantages. The most frequently mentioned shortcomings are: incompatibility of programs and commands; a reduced need for labor force, increasing the unemployment problem; creativity is conditioned by the developer; lack of human contact; the use of artificial intelligence can lead to laziness in younger generations; it requires a lot of time and money; increased technological dependence (Chhaya et al., 2020).

7 Conclusions

The implementation of artificial intelligence in education creates new opportunities for improving the educational process. By using artificial intelligence, teachers enjoy various benefits such as faster data collection and development of new teaching strategies (Hwang et al., 2020). Teachers' perceptions of artificial intelligence systems in education are conditioned by numerous factors, such as their pedagogical beliefs, previous experience in using them, and readiness to introduce artificial intelligence systems (Gilakjani et al., 2013; Kim and Kim, 2022). It appears that there is a large number of studies focused on the future of the teacher's role and position in the changed educational process (Huang et al., 2010; Lamas and Arnab, 2021; Ouyang et al., 2022), and that there is still a fear that the teaching profession will soon be replaced by artificial intelligence systems. Artificial intelligence systems require human control; thus, the human factor is unquestionable. Artificial intelligence through a personalized learning plan can become an innovation to transform the teaching process.

Research results (Bhosale et al., 2020; Khanzode, 2020; Chhaya et al., 2020) have shown that there are many advantages and disadvantages of implementing artificial technology in the teaching process. The consequences of the development of artificial intelligence cannot yet be predicted, but it is assumed that the applications of artificial intelligence will be the main issue of educational technology in the next few years. These tools have great potential to support students and teachers (Zawacki-Richter et al., 2019). Teachers already use ChatGPT to provide feedback to students. What should be pointed out is that it is difficult to ignore all the new tools that have been created or will be created, however, it is important to learn how to use any tool properly. All the mentioned models are continuously being improved to include even more data, which will inevitably have an impact on our daily life and work. Furthermore, we are only at the beginning of what artificial intelligence can achieve, and it is evident that new technology can help people improve their lives.

Tamara N. Dragojević, dr. Milena M. Letić Lungulov

Umetna inteligenca v izobraževalnem kontekstu: vrednost in izzivi

Umetna inteligenca je sposobnost strojev, da se prilagajajo popolnoma novim situacijam, odgovarjajo na vprašanja, rešujejo probleme in tudi opravljajo funkcije, značilne za ljudi. V izobraževanju umetna inteligenca razvija nove sisteme in rešitve za učenje učencev, pa tudi za učenje učiteljev. Dve izmed ovir, ki bi jih bilo treba premagati, sta nezadostna tehnološka opremljenost izobraževalnih ustanov in nezadostna usposobljenost učiteljev o umetni inteligenci. Prav tako bi lahko rekli, da je uporaba umetne inteligence pomembna zaradi več razlogov: integracije – lahko se integrira z drugimi inteligentnimi tehnologijami; avtomatizacije procesa – učitelji lahko povečajo interakcijo s študenti z avtomatizacijo preprostih nalog preko umetne inteligence; identifikacije – umetna inteligenca bo prepoznala prednostna področja študenta. Aplikacija umetne inteligence lahko ustvari prilagojen učni načrt za specifične potrebe študenta. Intelligentni sistem za tutoriranje (ITS) uporablja tehnike umetne inteligence za simulacijo individualnega po-

učevanja, zagotavlja učne dejavnosti, ki najbolj ustrezajo učencu, ter omogoča pravočasno povratno informacijo brez prisotnosti učitelja. Umetna inteligenca lahko prevaja predstavitev učitelja v kateri koli jezik, ki ga študent izbere. To je še posebej pomembno za študente s slušnimi ali vizualnimi ovirami. Umetna inteligenca lahko tudi izboljša metode ocenjevanja v tradicionalnih učilnicah, saj zagotavlja pravočasne informacije o napredku študenta pri učenju. Omogoča ugotavljanje, ali je študent podal pravilen odgovor; hkrati pa učitelju omogoča vpogled v študentove korake, ki vodijo do pravilnega odgovora. Prav tako umetna inteligenca uspešno zazna psihološka stanja študentov.

Poleg definicije umetne inteligence članek predstavlja najpomembnejše raziskave na tem področju. Prva raziskava, ki je bila predstavljena v tem članku, je raziskava avtorjev Kim in Kim (2022), katere namen je bil preučiti, kako učitelji dojemajo implementacijo umetne inteligence v izobraževalni proces. Rezultati so pokazali, da ima večina učiteljev pozitiven odnos do umetne inteligence v izobraževanju (Kim in Kim, 2022). Raziskava (Celik idr., 2022), ki je preučevala uporabo umetne inteligence in metod strojnega učenja s strani učiteljev, je pokazala, da umetna inteligenca učiteljem ponuja več možnosti za učinkovito načrtovanje poučevanja. Z uporabo umetne inteligence so učitelji lažje ocenjevali študente. Študentom so zagotavljali takojšnje povratne informacije in razvijali nove vloge v poučevanju.

Relevantna študija (Zhao idr., 2019) je pokazala, da je uporaba poučevanja na osnovi umetne inteligence močno povezana z akademskimi dosežki študentov. Posledično študenti dosegajo visoke rezultate pri poučevanju na osnovi umetne inteligence. Raziskave so pokazale, da ima uporaba umetne inteligence pozitiven vpliv na znanstveno pisanje študentov naravoslovnih ved (Kim in Kim, 2022). Raziskava, ki sta jo izvedla Paek in Kim (2021), je bila namenjena razumevanju vpliva umetne inteligence na izobraževanje. Raziskava je bila izvedena z analizo mednarodnih raziskovalnih trendov in oceno usmeritve izobraževanja v prihodnosti. Avtorja sta izpeljala ključne raziskovalne teme in analizirala trende raziskav na področju umetne inteligence v izobraževanju, kot so spremembe v raziskovalnih temah. V bazi Web of Science sta našla skupno 5.035 člankov, povezanih z uporabo umetne inteligence v izobraževanju. V zadnjih 20 letih se je število člankov o implementaciji umetne inteligence v izobraževanje povečalo. Še posebej hitro povečanje od leta 2015 naprej kaže, da postaja vpliv umetne inteligence na izobraževanje vse pomembnejši (Paek in Kim, 2021). Eden od pomembnih orodij umetne inteligence je ChatGPT, o katerem smo podrobneje pisali v okviru članka. Ta tehnologija ima potencial, da v prihodnosti spremeni izobraževalne dejavnosti. Lani je bil predstavljen klepetalnik, imenovan ChatGPT-3, in očitno je, da bo ta uporaba umetne inteligence imela ogromne posledice za vse vidike družbe (Tlili idr., 2023). Oblikovan je na način, da razume jezik in ponuja ustrezne odgovore na uporabnikova vprašanja. Vključuje veliko količino podatkov, vendar so vsi modeli usposobljeni na podatkih do leta 2021 (Halaweh, 2023).

Ko govorimo o robotih pri poučevanju, se mnenja razlikujejo, nekateri avtorji verjamejo, da roboti nikoli ne bodo mogli prevzeti vloge učiteljev. Roboti učitelji imajo veliko prednosti pred človeškimi učitelji. Natančneje, sposobnost strojev za obdelavo ogromnih količin informacij in uporabo različnih načinov za zadovoljevanje potreb študentov predstavlja pomembno področje, na katerem umetna inteligenca presega ljudi (Bosede in Cheok, 2018). Prav tako se nanaša na sposobnost interakcije z ljudmi, ki se učijo, brez človeških čustev, ki bi ovirala proces. Neprekinjeno vzdrževanje ekipe zadovoljnih učiteljev je izziv, vendar se lahko s pomočjo umetne inteligence to opravi veliko ceneje, če so to roboti,

kar nakazuje, da bi roboti lahko bili dober "nadomestek" za učitelje. Dober primer uporabe robotov v šolah je šola Savremena iz Beograda. Šola ima svojega lastnega pomočnika pri poučevanju, tj. robota Pepperja. Ta robot lahko komunicira preko glasovnih ukazov in hitro reagira na človeška čustva. Pepper ima tudi 2D in 3D HD kamere, ki mu omogočajo, da vidi vse v svojem okolju (Kuleto idr., 2022). Pomembno je poudariti, da ta robot ne more delovati kot samostojni učitelj, ampak le kot pomočnik učitelja (Kuleto idr., 2022).

Da bi razvili ozaveščenost, kompetence in poučevalne veščine z uporabo umetne inteligence v izobraževanju, bi morali učitelji pridobiti določene digitalne veščine in sposobnosti, ki bi bile ključne za vlogo motivatorjev pri poučevanju na podlagi umetne inteligence. Poleg digitalnih kompetenc bi morali učitelji: razumeti značilnosti umetne inteligence v izobraževanju, da bi lažje sprejemali odločitve; izboljšati svoje raziskovalne veščine, da bi usmerjali učenje študentov; razviti duh sodelovanja in veščine vodenja, da bi zagotovili svojo interakcijo s pomočniki pri poučevanju. Percepcije učiteljev o sistemih umetne inteligence v izobraževanju se razlikujejo glede na njihova pedagoška prepričanja, pedagoške izkušnje, prejšnje izkušnje pri uporabi izobraževalne tehnologije, kar lahko vpliva na njihovo pripravljenost sprejetja nove izobraževalne tehnologije (Gilakjani idr., 2013; Kim in Kim, 2022). Veliko število avtorjev se je ukvarjalo s prednostmi in slabostmi uporabe umetne inteligence. Prednosti umetne inteligence v izobraževanju so lahko:

- personalizacija učenja: umetna inteligenca lahko prilagodi izobraževalni proces posameznim potrebam učencev, jim omogoča prilagojene lekcije, vaje in povratne informacije;
- učinkovitost in produktivnost: učenje z uporabo umetne inteligence lahko postane bolj učinkovito in produktivno, saj lahko računalniški programi hitreje obdelajo informacije in ponudijo ustrezne vire;
- interaktivnost: sistemi umetne inteligence omogočajo interaktivno učenje prek simulacij, virtualnih eksperimentov ali dialoga s klepetalnimi roboti;
- spremljanje napredka: umetna inteligenca lahko s spremljanjem in analizo podatkov o učenju omogoči vpogled v napredek vsakega učenca, kar omogoča učiteljem, da prilagodijo svojo podporo in intervencije.
- Navedene so le nekatere od mnogih obravnavanih prednosti in slabosti uporabe umetne inteligence v izobraževanju, avtorji pa pogosto izvajajo podrobnejše analize in raziskave, da bi zagotovili globlje vpogled v to temo.

Vendar pa se prav tako izpostavljajo nekatere slabosti umetne inteligence v izobraževanju, kot so:

- izguba človeške interakcije: uporaba umetne inteligence lahko zmanjša človeško interakcijo in osebni pristop, ki ga učitelji nudijo učencem;
- pomanjkanje čustvene povezanosti: računalniški programi nimajo čustvene inteligence, zato lahko manjka empatija ter sposobnost prepoznavanja in odzivanja na čustvene potrebe učencev;
- etika in vprašanja zasebnosti: uporaba umetne inteligence v izobraževanju postavlja vprašanja o zaščiti zasebnih podatkov učencev in etičnih vidikih uporabe tehnologije;
- tehnične težave: uvedba umetne inteligence v šolskem okolju se lahko sooča s tehničnimi težavami, kot sta vzdrževanje in posodabljanje tehnološke infrastrukture.

Najpogostejše omenjene pomanjkljivosti so: neskladje med programi in ukazi; zmanjšana potreba po delovni sili, večji problem brezposelnosti; ustvarjalnost je pogojena s strani razvijalca; pomanjkanje človeškega stika; uporaba umetne inteligence lahko vodi k lenobi pri mlajših generacijah; zahteva veliko časa in denarja; večja tehnološka odvisnost. Če učitelji uporabljajo umetno inteligenco, imajo različne koristi, kot sta hitrejša zbiranje podatkov in razvoj novih učnih strategij (Hwang idr., 2020). Učiteljevo zaznavanje sistemov umetne inteligence v izobraževanju je pogojeno z različnimi dejavniki, kot so: njegova pedagoška prepričanja, prejšnje izkušnje z uporabo takih sistemov, pripravljenost na uvedbo sistemov umetne inteligence (Gilakjani idr., 2013; Kim in Kim, 2022). Posledice razvoja umetne inteligence še ni mogoče napovedati, vendar se predpostavlja, da bodo aplikacije umetne inteligence glavna tema v okviru tehnologij izobraževanja v naslednjih nekaj letih. Ta orodja imajo velik potencial za podporo učencem in učiteljem (Zawacki-Richter idr., 2019). Učitelji že uporabljajo ChatGPT za zagotavljanje povratnih informacij učencem. Pomembno je poudariti, da je težko prezreti vsa nova orodja, ki so bila ustvarjena ali bodo ustvarjena, vendar je pomembno, da se naučimo pravilno uporabljati vsako orodje.

Torej je pomembno, da so tako učitelji kot študenti ustrezno usposobljeni za uporabo sistemov umetne inteligence v izobraževalnem procesu. Učitelji morajo razumeti, kako ti sistemi delujejo in kako jih lahko najboljše vključijo v svoje poučevanje. Prav tako morajo biti sposobni podpirati študente pri uporabi teh orodij in razlaganju rezultatov, pridobljenih z umetno inteligenco. Po drugi strani pa morajo biti tudi študenti usposobljeni za uporabo sistemov umetne inteligence. Morajo se naučiti, kako lahko izkoristijo ta orodja za izboljšanje svojega učenja, kako si razlagati rezultate in kako učinkovito uporabljati pridobljene informacije. Prav tako morajo biti ozaveščeni o etičnih vidikih uporabe umetne inteligence in se naučiti, kako jo uporabljati odgovorno in brez zlorabe. Usposabljanje učiteljev in študentov za uporabo sistemov umetne inteligence bi moralo biti del njihove strokovne rasti v izobraževalnem sektorju. To bo omogočilo, da bodo vsi udeleženci izobraževalnega procesa maksimalno izkoristili prednosti umetne inteligence in jo učinkovito uporabljali pri svojem poučevanju in učenju.

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Tamara N. Dragojević, MA, Demonstrator at the Faculty of Philosophy, University of Novi Sad.
E-mail: tamaradragevic27@gmail.com

Milena M. Letić Lungulov, PhD, Assistant Professor at the Faculty of Philosophy, University of Novi Sad.
E-mail: milenaletic@ff.uns.ac.rs

Generativna UI kot nova paradigma v izobraževanju in v življenju

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Znanstveni članek

UDK 004.8:37

KLJUČNE BESEDE: generativna umetna inteligenca, ChatGPT, izobraževanje, seminarske naloge

POVZETEK – Hitro napredovanje razvoja generativne umetne inteligence (GenUI) in klepetalnikov, kot je ChatGPT, je močno spremenilo naše razumevanje sposobnosti UI. Prispevek raziskuje vpliv GenUI na gospodarstvo in izobraževanje, izpostavljajoč njen potencial za avtomatizacijo številnih nalog, ki jih prej nismo mogli izvajati z računalniki. V prispevku z uporabo kvalitativne deskriptivne metode in induktivne metode identificiramo vplive GenUI klepetalnikov na vsakdanje življenje in izobraževanje. V posebnem poglavju obravnavamo vpliv na vsakdanje življenje, ki se kaže preko vpliva na industrijo v praktično vseh panogah. Z GenUI lahko povečamo učinkovitost in produktivnosti ter izboljšamo analizo podatkov in napovedovanje. Sprememba je pri izobraževanju, kjer se je najprej trud (učenje) in nato rezultat z uporabo GenUI obrnil v najprej rezultat in nato trud s preverjanjem točnosti odziva GenUI. Ker je danes veliko nalog rešljivih z GenUI, dodajamo priporočila, kako pravilno uporabiti nova orodja in kako spremeniti načine izobraževanja. Poudarjamo tudi potrebo po skrbni raziskavi in reševanju izzivov, povezanih z uporabo GenUI, ter zagotavljanju etične in odgovorne uporabe te tehnologije.

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Scientific paper

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KEYWORDS: generative artificial intelligence, ChatGPT, education, seminar papers

ABSTRACT – The rapid development of generative artificial intelligence (GenAI) and chatbots such as ChatGPT has profoundly changed our understanding of AI capabilities. This paper explores the impact of GenUI on the economy and education, highlighting its potential for automating tasks previously unfeasible with computers. Using qualitative descriptive and inductive methods, the paper identifies the effects of GenUI chatbots on daily life and education. A special chapter addresses its influence on everyday life, evident across almost all industries. GenUI enhances efficiency, productivity, and improves data analysis and forecasting. A notable change is observed in education, where the effort (learning) and then the result using GenUI has shifted to first achieving results and then effort by verifying the accuracy of GenUI responses. As many tasks are now solvable with GenUI, we provide recommendations on the proper use of these new tools and how to adapt educational methods. We also emphasise the need for carefully exploring and addressing the challenges associated with the use of GenAI, and highlight the necessity for ensuring ethical and responsible use of this technology.

1 Uvod

V zadnjih letih smo bili priča revolucionarnemu napredku v svetu generativnih umetno inteligenčnih (GenUI) modelov. Ti modeli, kot na primer ChatGPT, so se izkazali za sposobne spreminjati našo percepcijo o tem, kaj lahko umetna inteligenca doseže. Spreminjajo tudi naš način interakcije z računalniki. Vendar pa s temi naraščajočimi sposobnostmi prihajajo tudi številni izzivi in vprašanja, ki zadevajo tako gospodarstvo kot tudi izobraževalni sistem.

V prispevku se osredotočamo na raziskavo vpliva GenUI na različna področja, od gospodarstva do izobraževanja, in raziskujemo, ali smo že identificirali področja apli-

kacije v prakso. Naš namen je razkriti potencialne koristi, izzive in etična vprašanja, povezana z GenUI, ter preučiti, kako se lahko ta tehnologija vključi v vsakodnevno življenje in izobraževalni sistem. Na podlagi pregleda različnih virov in razmišljanj različnih avtorjev bomo predstavili raznolike poglede na GenUI, ki so se oblikovali do 20. 10. 2023. Kljub hitremu napredku na tem področju pa se še vedno pojavljajo številna vprašanja in dileme, ki zahtevajo nadaljnje raziskave in razpravo.

V tretjem poglavju prikažemo porast zanimanja za GenUI modele in življenjski cikel, kot ga razumejo pri Gartnerju. Četrto poglavje je sestavljeno iz dveh delov. Najprej se osredotočimo na potencialne možnosti uporabe v industriji in vpliv na vsakdanje življenje, ki se v največji meri kaže skozi vpliv na industrijo. Drugi del poglavja namenimo vplivu na izobraževalni sistem, kjer pozornost posvetimo problemu plagiarizma in problemu prilagoditve šolskega sistema na uporabo GenUI orodij. Predstavimo različne pristope in strategije, ki jih lahko uporabimo za odgovorno integracijo tehnologije v učni proces. Peto poglavje je namenjeno kritičnemu pogledu na omejitve raziskave in predlogu, kako raziskovati naprej. Poudarimo tudi, da je ključno, da se GenUI integrira v izobraževalni sistem na način, ki spodbuja kritično razmišljanje, ustvarjalnost in etično uporabo tehnologije. Samo tako bomo lahko izkoristili potenciale GenUI za izboljšanje procesa izobraževanja.

2 Metodologija

Pri pregledu dosegljivih virov je bila uporabljena kvalitativna deskriptivna metoda, s katero smo opisali stanje, in metoda kompilacije, s katero smo povzeli tuje rezultate znanstvenoraziskovalnega dela. Uporabili smo tehniko namiznega raziskovanja, pri čemer smo sistematično zbrali in analizirali sekundarne vire.

V članku so navedeni relevantni izbrani viri, ki so vsebinsko v največji meri pokrivali področje. Do seznama dobrih praks smo prišli z uporabo induktivne metode, s katero je bilo moč posamične prakse priporočiti za splošno rabo. Raziskava je trajala od marca do oktobra 2023 in ker je področje v izjemno hitrem razvoju, je večina uporabljenih virov blizu zadnjemu datumu raziskave.

3 Generativni modeli umetne inteligence

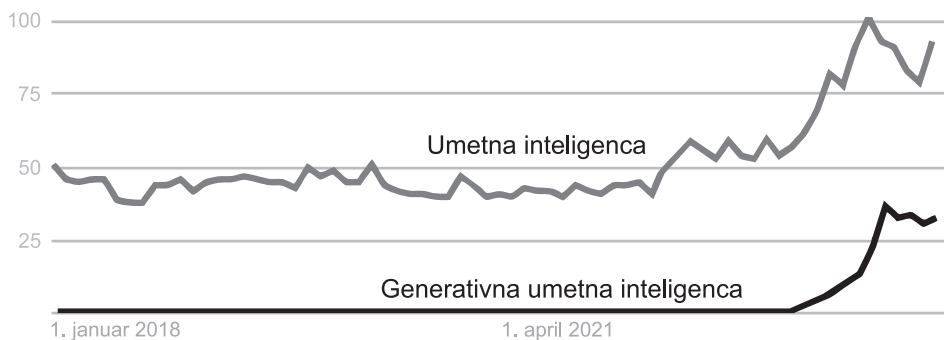
Pri Gartnerju (2023) ugotavljajo, da lahko generativna umetna inteligenca (GenUI) korenito spremeni obstoječe gospodarstvo in družbo. To primerjajo s pojavom interneta in še prej z iznajdbo elektrike. GenUI bo lahko postala konkurenčna prednost in razlikovalni dejavnik. Avtomatizira lahko ponavljajoča se in dolgačasna opravila ter ustvarja nova spoznanja, ideje in inovacije z napovedno analitiko, strojnim učenjem (ML) in drugimi metodami UI.

Da je povzročil veliko zanimanje javnosti, izpričuje tudi pregled Google zadetkov (slika 1). Povečanje zanimanja za "Artificial intelligence" sovпада s povečanjem zani-

manja za “Generative AI”. Zanimanje za umetno inteligenco se je povečalo skupaj z zanimanjem za generativno umetno inteligenco in povečanje še kar vztraja, kar nakazuje, da se tehnologija širi.

Slika 1

Google Trends in iskalna niza “Artificial intelligence” in “Generative AI”



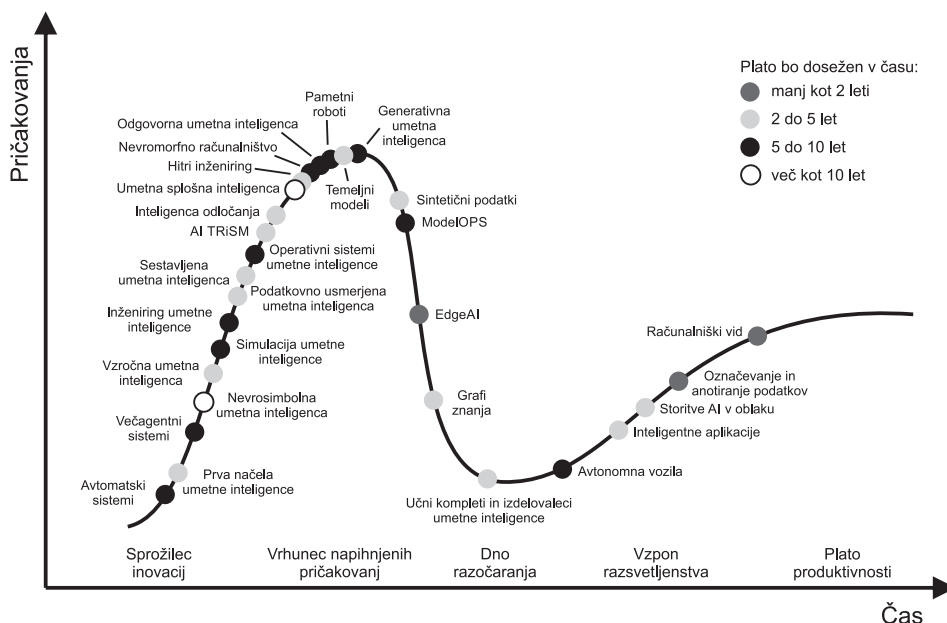
Vir: <https://trends.google.com/trends/explore?date=2018-01-01%202023-10-02&q=Generative%20AI,Artificial%20intelligence&hl=en-GB>

Gartner kot največja svetovalna hiša na področju IKT redno izdaja preglede posameznih tehnologij. V poročilu *What's New in Artificial Intelligence from the 2023 Gartner Hype Cycle* ugotavljajo (Gartner, 2023), da je GenUI dosegla vrh pričakovanj in bo sledila streznitev, ki jo določajo omejitve GenUI. Vrh produktivnosti se pričakuje v 5 do 10 letih (slika 2). Vidi jo tudi dve poti napredka do še močnejše UI, in sicer pot preko inovacij, ki jih bo poganjala GenUI, in pot, kjer bodo inovacije povečevale zmognosti GenUI.

Ker pa je v človeški naravi, da precenjujemo kratkoročni razvoj in podcenjujemo dolgoročnega, se lahko zgodi, da bo vrh produktivnosti dosežen prej. Danes nastaja veliko zagonskih (startup) podjetij, ki vgrajujejo zmognosti GenUI v svoje predvsem programske rešitve. Z uporabo API vmesnikov do GenUI modelov izdelujejo programe, ki olajšujejo delo na veliko področjih.

Slika 2

Gartnerjeva krivulja (Hype Cycle) stanja tehnologij umetne inteligence v 2023



Vir: <https://www.gartner.com/en/articles/what-s-new-in-artificial-intelligence-from-the-2023-gartner-hype-cycle>

4 Rezultati pregleda virov

Pri pregledu virov smo se omejili na dve področji vpliva GenUI: na področje vsakdanjega življenja in na področje šolstva. Ker področje vsakdanjega življenja obsega cel življenjski cikel, smo pregled osredotočili na vpliv na industrijo. Vplivi na to področje se posledično poznajo na vseh področjih.

Vpliv na vsakdanje življenje

GenUI na osnovi tekstovnih ukazov in opcijsko dodanih datotek ali vnesenih spletnih povezav generira tekste, slike in grafe za veliko število raznih potreb. Čeprav je manj sposobna kot ljudje, na številnih področjih že dosega človeško raven. Pri OpenAI (2023a) so izvedli teste z različnimi javno dostopnimi akademskimi in profesionalnimi teksti. Npr. pri simuliranem testu odvetniškega izpita se je ChatGPT-4 uvrstil med 10% najboljših udeležencev izpitov.

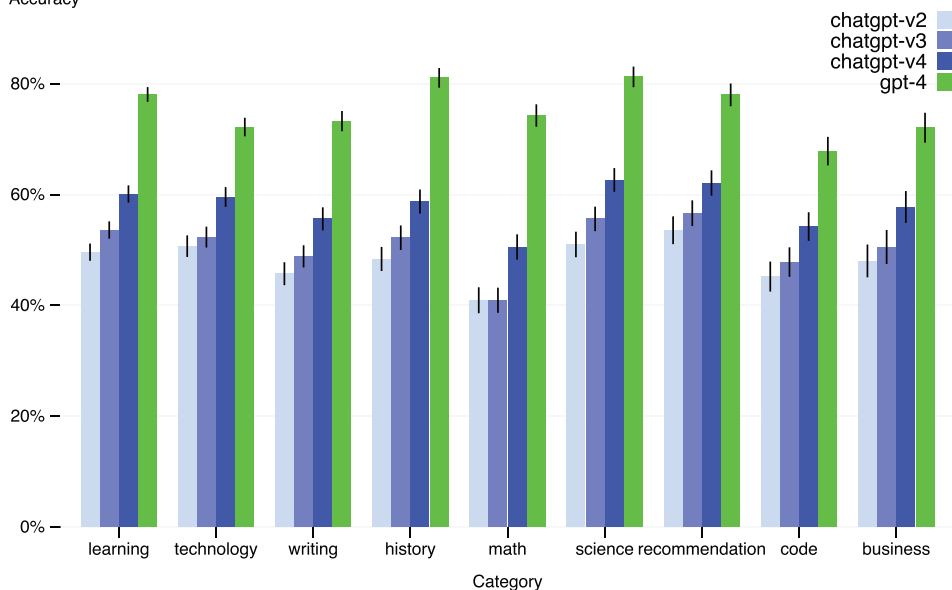
Vseeno vpliva GenUI na vsakdanje življenje še ni opaziti v večjem obsegu, a se to hitro spreminja. Najprej smo opazili naraščanje števila novinarskih prispevkov v vseh medijih. Sledila je uporaba v podjetjih in šele sedaj se počasi spreminja tudi naša interakcija z računalniki. Seveda bo povečevanje uporabe šlo skupaj z naraščanjem znanj, kako pravilno pisati ukaze za GenUI.

Najbolj sporno področje je haluciniranje, ko lahko GenUI generira tekst, ki je sicer videti verodostojno in se lepo bere, a je faktografsko napačen. Zaradi te lastnosti GenUI modelov je rezultate – odzive potrebno preverjati in je nujno poznavanje področij, pri katerih GenUI uporabljamo. Vendar se tudi na tem področju dela velike napredke. Na sliki 3 je prikazan napredek po generacijah GPT modelov. Točnost 100 % pomeni, da so odgovori skladni z idealnimi človeškimi odgovori.

Slika 3

Faktografska točnost GPT modelov

Accuracy

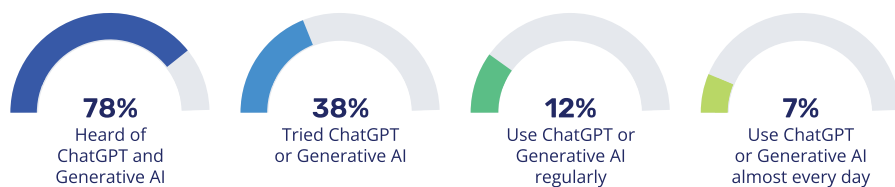


Vir: <https://cdn.openai.com/papers/gpt-4.pdf>

Ena zadnjih študij, ki je bila avgusta 2023 izvedena v ZDA med splošno populacijo (n = 880) (Burg in Roehm, 2023), je pri reprezentativnem starostnem vzorcu populacije, starejše od 18 let, pokazala, da je 78 % sodelujočih v raziskavi že slišalo za GenUI in ChatGPT, da je 38 % že poizkusilo uporabo, a jih samo 12 % GenUI uporablja redno in samo 7 % dnevno (slika 4). Raziskovalci so pri tem opozorili, da te številke vključujejo le ljudi, ki vedo, da uporabljajo UI, četudi je ta vključena v številne izdelke in storitve, in da je odstotek uporabe GenUI preko spletnih strani bistveno večji, saj večina uporabnikov ne ve, katera tehnologija poganja spletno stran.

Slika 4

Delež splošne populacije, ki pozna GenUI v ZDA. Študija avgust, 2023.

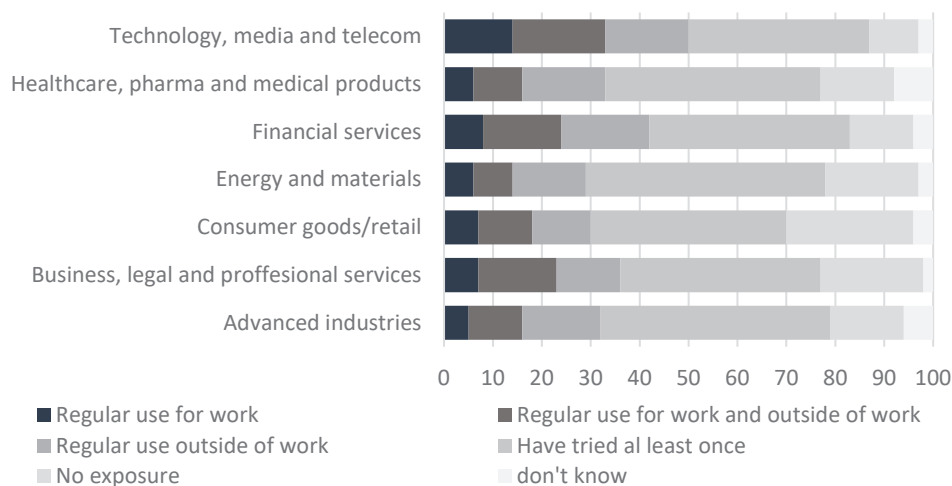


Vir: <https://techsee.me/wp-content/uploads/2023/09/Generative-AI-for-the-General-Public-in-2023.pdf>

V časovno enakem obdobju kot prej navedeno raziskavo so pri McKinsey & Company (2023) izvedli globalno raziskavo (n = 1.684) o uporabi GenUI v različnih branžah industrije (slika 5). Izsledki te raziskave so pokazali, da tretjina vseh vprašanih pravi, da njihove organizacije že redno uporabljajo GenUI v vsaj eni funkciji. 40% tistih, ki so poročali o uvedbi GenUI, pravi, da bodo še več vlagali v GenUI. Najpogostejše poslovne funkcije, kjer je generativna UI v uporabi, so enake tistim, kjer je uporaba UI na splošno najpogostejša: trženje in prodaja, razvoj izdelkov in storitev ter skrb za stranke in zaledna podpora. To nakazuje, da organizacije uvajajo nova orodja tam, kjer imajo največjo vrednost. Poleg tega je 79% vprašanih odgovorilo, da so bili že vsaj malo izpostavljeni umetni inteligenci, bodisi pri delu bodisi zunaj njega. 22% jih je potrdilo, da GenUI uporabljajo redno pri svojem delu. Glede pričakovanj tri četrtine vprašanih pričakuje, da bo generativna UI v naslednjih treh letih povzročila prelomne spremembe pri konkurenčnosti industrije.

Slika 5

Uporaba GenUI v različnih branžah industrije



Vir: <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2023-generative-ais-breakout-year>

Glede vpliva GenUI na poslovanje je razpravljalo več avtorjev. Vplivi so identificirani na mnogo področjih.

Pri GB Advisors (2023) vpliv vidijo na področjih:

- Racionalizacije prodajnih procesov: kot povečanje sposobnosti sklenitve več poslov, ustvarjanja tesnejše povezave s kupci, povečanja učinkovitosti in fleksibilnosti ter večje uporabe informacij v realnem času.
- Povečanja produktivnosti z uporabo orodij, ki avtomatizirajo procese in opravila. Posebej pri ustvarjanju dokumentov, evidencah in drugih rutinskih opravilih, ki jih je moč prenesti na avtomatizirane sisteme. S tem bodo zaposleni lahko svojo pozornost in znanja prenesli na naloge, ki prinašajo večjo dodano vrednost.
- Boljšega upravljanja z informacijami preko analize in obdelave velikih količin podatkov. Generativna UI lahko prepozna vzorce, trende, nedoslednosti in napake v neobdelanih podatkih.

Pri Statista (2023) ugotavljajo, da lahko GenUI poveča avtomatizacijo procesiranja podatkov za 11 % in avtomatizacijo zbiranja podatkov za 17,5 %. Svetovna rast produktivnosti se bo lahko povečala iz 2,6 % na 3,2 %. Sicer ne enako po vseh državah.

McCullough (2023) je navedel množico potencialnih področij, ki zadevajo finančne direktorje: prepozna priložnosti za zmanjšanje stroškov – analitika, avtomatizacija finančnih procesov, izboljšanje sprejemanja odločitev z boljšim vpogledom v podatke, izboljšanje napovedovanja, večja učinkovitost z avtomatizacijo finančnih opravil, optimizacija procesov, razvoj talentov in spretnosti ter izpopolnjevanje finančnih strokovnjakov, iskanje učinkovitejših finančnih strategij in prepoznavanje priložnosti za rast prihodkov in tržnih trendov.

Identificiran je tudi vpliv na druge industrije (Guedes, 2023):

- Energetiko, kjer komunalna podjetja vlagajo v razvoj GenUI za ustvarjanje vsebin za storitve za stranke in v upravljanje znanja. Drugi primeri uporabe v energetiki so napovedovanje za upravljanje sredstev, generiranje vsebin za prodajo in marketing ter generiranje besedil za pomoč vodjem.
- Vladne službe, npr. portugalska vlada je objavila “Praktični vodnik za dostop do pravosodja”. Državljeni lahko uporabljajo ChatGPT za pomoč pri pridobivanju pravnih informacij v laičnem jeziku. GenUI bo izboljšala uporabniško izkušnjo državljanov pri sodelovanju z vladnimi službami in okrepila kompetence javnih uslužbencev, ki se srečujejo z veliko količino dokumentov.
- Prodajo, kjer lahko generativna UI avtomatizira in personalizira procese e-trgovin. Sestava strani z opisi izdelkov, s slikami in video vsebinami pri klasičnem načinu izdelave zahteva veliko časa. Potencialna uporaba je še v trženju, v optimizaciji oskrbnih verig in v odnosih s strankami.
- Arhitekturo, inženiring in gradbeništvo. Generativna UI lahko na podlagi gradbenih predpisov, varnostnih standardov in drugih meril ustvari načrte stavb. In to ni vse. Generativna UI ima potencial popravljanja napak, tako da lahko pridemo do optimiziranih gradbenih načrtov.

Poleg navedenih področij vidimo še potencialno velik vpliv na področjih zdravstva in proizvodnje zdravil, kjer se bo pohitrilo procese razvoja novih zdravil, saj bo generativna UI zaradi velikega korpusa naučenih virov hitreje zgradila in simulirala nove

učinkovine. Enako velik potencial ima tudi pri razvoju novih kemikalij in materialov. V proizvodnih sistemih bo lahko prišlo do večje vključenosti strank, kar bi lahko posledično vodilo v spremembe poslovnih modelov in prodajnih kanalov v smislu izključitve posrednikov in distributerjev ter nenazadnje tudi trgovcev na drobno.

Džeroski je v intervjuju (Senica, 2023) naslovil še druga področja, kjer lahko UI pomaga: od iskanja rešitev za blaženje posledic podnebnih sprememb, do iskanja rešitev, kako narediti kmetijstvo bolj trajnostno. Opozoril pa je na nevarnost, saj je mogoče z neresničnimi informacijami manipulirati množice in zamajati temelje demokracije.

Hitri uporabi na veliko področjih pritrjuje tudi raziskava, ki sta jo v juliju 2023 izvedli spletna izobraževalna platforma edX (ustanovljena 2012 s strani univerz Harvard in MIT) in raziskovalna agencija Workplace Intelligence (edX, 2023). Raziskava je zajela 1600 polno zaposlenih Američanov, polovica so bili vodstveni delavci, od tega je bilo 500 generalnih direktorjev in druga polovica zaposleni. Raziskava se je nanašala na UI in GenUI. Nekaj ključnih odgovorov vodstvenih delavcev:

- Do leta 2025 bo kar 49 % znanj in spretnosti danes zaposlenih delavcev neustreznih.
- Njihove organizacije bodo v naslednjih 5 letih ukinile 56 % del delavcev na začetni ravni znanj. Dodatno kar 79 % vodstvenih delavcev napoveduje, da delovnih mest z začetnimi znanji ne bo več.
- Večina oziroma 79 % vodstvenih delavcev je mnenja, da bodo nepripravljeni za bodoča dela, če se ne bodo naučili uporabljati UI.

Na drugi strani je mnenje drugih zaposlenih drugačno:

- Samo 20 % jih meni, da bo lahko večina ali njihovo delo v celoti zamenjano z UI.
- Glede pridobivanja UI znanj jih 24 % uporablja programe v organizacijah za učenje dela z UI in 39 % jih je pripravljeno zamenjati službo, če druga služba ponuja boljše možnosti učenja in osebnega razvoja.

GenUI se nas bo dotaknila na praktično vseh področjih, ki se danes digitalizirajo: v industriji, na spletnih servisih in storitvah, pri nakupovanju in v šolstvu. Verjamemo, da bo vpliv na vsakdanje življenje neposredno najbolj viden tudi pri spremembi iskanja po spletu. Google iskalnik bo dobil pomoč UI in uporabniki ne bomo več iskali med množico zadetkov, ampak bo UI pripravila najbolj relevanten odgovor na naše povpraševanje.

Vpliv na izobraževanje

Kljub digitalni transformaciji in Industriji 4.0 je šolstvo še vedno na temeljnih tehnologijah učenja v smislu predavanj, podprtih z multimedijskimi pripomočki. GenUI danes predstavlja priložnost za transformacijo celotnega učnega procesa. Priča smo tudi takim mnenjem: “Generativna UI prinaša novo ero dostopnih informacij in avtomatizacije za izboljšanje kakovosti izobraževanja” in “Generativna UI lahko uniči nekatere izobraževalne prakse, hkrati pa jih podpira” (Lim idr., 2023).

Vplivov na šolski sistem je veliko, od pomoči predavateljem do prevzema nalog osebnega tutorja za študente.

V nadaljevanju se bomo omejili zgolj na dve področji – na področje plagiatorstva in področje priporočil za šolski sistem.

Plagiarizem

GenUI lahko izboljša učinkovitost izobraževalnih procesov, vendar se pojavljajo tudi etična vprašanja, kot so pristranskost UI in avtorstvo generiranega teksta. Etične vidike je treba vključiti v izvajanje in uporabo GenUI. S strani GenUI generirani tekst ne smemo uporabiti kot lastno delo in ga ne moremo navesti kot vir v strokovnih in znanstvenih prispevkih, kajti teksta GenUI ne generira sama, ampak nastane kot odziv na naš vneseni tekst (angl. *prompt*). Na mednarodni konferenci o strojnem učenju ICML (2023) so objavili politiko uporabe teksta, generiranega s pomočjo GenUI: "Prispevki, ki vključujejo besedilo, ustvarjeno z obsežnim jezikovnim modelom (LLM), kot je ChatGPT, so prepovedani, razen če je ustvarjeno besedilo predstavljeno kot del eksperimentalne analize prispevka."

Za ugotavljanje plagiatorstva imamo na voljo več orodij. Za preverjanje UI plagiatorstva je teh orodij manj. Navedemo naj tri pomembnejša orodja, ki ugotavljajo, ali je tekst napisal človek ali generativna UI:

- Podjetje *Turnitin* že od leta 1998 spodbuja poštenost, doslednost in pravičnost na vseh področjih izobraževanja in akademskega raziskovanja (Turnitin, 2023a). Njihova orodja za preverjanje plagiatorstva so standard v akademski sferi. Za preverjanje UI besedil so ustanovili Turnitin AI Innovation Lab, ki je središče za nove in prihajajoče izdelke na področju pisanja z umetno inteligenco. Po njihovih trditvah program za ugotavljanje UI plagiarizma v 97% pravilno identificira tekste, napisane z GPT-3 in ChatGPT in samo v 1% pozitivno napačno tekst opredeli kot napisan z UI (Turnitin, 2023b). Program UI napisane stavke pobarva glede na verjetnost pisanja z UI. Tehnologije in načina delovanja programa niso razkrili.
- Program *GPTZero*, ki ga je v začetku 2023 razvil študent Edward Tian, študent Univerze Princeton, je v začetku ugotavljal UI napisane tekste na osnovi variacije in zapletenosti stavkov. Danes je program močno izboljšán (GPTZero, 2023) in je prilagojen na veliko študentskih tekstih, ima dostop do tekstov na internetu, prepozna običajne metode, s katerimi se poizkuša prevarati UI detektorje, izboljšán je pregled variabilnosti in kompleksnosti stavkov, pregleduje verjetnosti pojavljanja stavkov v kontekstu sestavka in naučen je na velikem korpusu besedil ter UI generiranih besedil. Zagotavljajo, da je točnost programa 99% pri odkrivanju tekstov, napisanih s strani ljudi, in 85% pri tekstu, napisanem s strani GenUI.
- Pri Edukado AI s programom *Aicheatcheck* (Bleumink in Shikhule, 2023) obljublja jo veliko natančnost ugotavljanja UI napisanega teksta (do 99,7%). Objavili so, da so njihov program naučili s kombinacijo besedil ChatGPT, GPT-3 in človeško napisanih besedil. Učna množica je obsegala približno 50.000 besedil, ki jih je ustvaril človek v primerjavi z besedili GPT, in sicer na raznih stopnjah izobrazbe. Z namenom, da bi zagotovili uporabo modela za različne sloge pisanja, so v GPT-3 in ChatGPT pripravili rezultate, ki ustrezajo vsem stopnjam izobrazbe med srednjo šolo in doktoratom. Na koncu model izračuna binarno klasifikacijsko oceno, ki določa, ali je besedilo ustvarjeno z UI ali ga je ustvaril človek.

Vendar noben program za ugotavljanje UI plagiatorstva ni 100-odstoten, čeprav se tej številki vsaj po lastnih trditvah ponudnikov že zelo približajo. Količina tekstov, ki jih bo ustvarila UI, bo s časom naraščala in bo vedno težje ločevati UI napisan tekst od človeško napisanega. Ker programi za ugotavljanje UI plagiatorstva nastanejo vedno po

objavi novih generativnih UI jezikovnih modelov, lahko sklepamo, da ugotavljanje UI plagiatorstva zamuja in bo vedno zamujalo glede na razvoj novih programov. Meja med UI in človeško napisanim tekstom bo vedno bolj zabrisana.

Da programsko ugotavljanje UI plagiatorstva ne deluje, je ugotovil Sankar Sadasi-
van s sodelavci (2023). V obsežni študiji z izvedenimi praktičnimi primeri ugotavljajo:

- Da tudi najsodobnejši programi za odkrivanje UI plagiatorstva v praktičnih scenarijih ne morejo zaznati UI generiranega teksta, saj se jih lahko hitro preslepi s parafraziranjem besedila.
- Tudi drugi pristopi, npr. z vodnimi žigi k UI generiranemu tekstu niso uspešni, saj se te žige lahko podtakne.
- Nujno je uravnotežiti detektiranje. Visoki delež lažno pozitivnih rezultatov vodi v obtoževanje nedolžnih in v zmanjšanje kredibilnosti detektorjev. Varnostne metode morajo biti robustne in ne preveč omejujoče z namenom, da se ne ustvari napačen občutek varnosti pri uporabi detektorjev.

Podobno ugotavljajo tudi pri OpenAI. Vest o tem so povzeli pri ArsTechnica (Benj, 2023). Pravijo, da se besedilo, napisano z UI, po ničemer ne razlikuje vedno od besedila, ki ga napiše človek. Še več, vse detektorje je moč prelisičiti s preoblikovanjem besedila (angl. *rephrasing*). Nekateri za namen ugotavljanja plagiarizma sprašujejo tudi direktno ChatGPT, ali je besedilo, ki ga vnesejo v ukaz, napisano s strani UI. Pri OpenAI (Benj, 2023) zagotavljajo, da ChatGPT nima “znanja o tem, katera vsebina je lahko UI generirana” in “odgovori so naključni in nimajo osnove v dejstvih.”

Učitelji vseeno niso povsem brez možnosti ugotavljanja UI plagiatorstva. Sum na UI generiran tekst je danes še možno ugotoviti na osnovi:

- Kandidatov stil pisanja se nenadoma spremeni.
- Pisanje je na višjem nivoju, kot bi pripadalo kandidatu.
- Vsebina ni ustrezna, saj kandidat ni preveril dejstev. Gre za tipično haluciniranje generativnih UI modelov.
- Viri ne obstajajo ali v njih ni povzetega teksta.
- Zapletenost besedila (angl. *perplexity*) je pri UI generiranem tekstu manjša.
- Variabilnost stavkov (angl. *burstiness*) je pri UI generiranem tekstu manjša.

Zadnja raziskava, ki so jo naredili pri GPTZero (Adam, 2023), je pokazala, da so tudi prej navedene možnosti razlikovanja UI teksta in človeško napisanega teksta že omejene in za ljudi zelo blizu naključnih 50%. Raziskavo so izvedli s 57 raziskovalci Vector Inštituta na Univerzi v Torontu. Udeleženci so morali med 5 odstavki teksta ugotoviti, ali je tekst napisal človek ali UI. Čeprav je šlo za kompetentne raziskovalce, ki najboljše poznajo jezikovne modele UI, se je izkazalo (tabela 1), da ne morejo razbrati vzorcev pisanja UI. Seveda lahko ugotovimo, da ima raziskava več pristranskosti, a vseeno nakazuje na kompleksnost problema.

Tabela 1*Ugotavljanje vira generiranega teksta s strani sodelujočih v raziskavi*

	<i>Tekst 1</i>	<i>Tekst 2</i>	<i>Tekst 3</i>	<i>Tekst 4</i>	<i>Tekst 5</i>
<i>Vir teksta</i>	UI	Človek	Človek	UI	UI
<i>Pravilnost ugotovitve vira s strani človeka</i>	58 %	72 %	44 %	46 %	60 %

Vir: <https://news.gptzero.me/the-next-generation-of-turing-tests/>*Priporočila za šolski sistem*

Različni avtorji so oblikovali svoja priporočila, ki so se jim zdela ustrezna glede za okolje in trenutno poznavanje tematike. V tabeli 2 smo zbrali nekaj teh priporočil, ki gredo v dve skrajnosti. Na eni strani gre za popolno prepovedovanje tehnologije in na drugi strani za potrebo po sprejemanju in vključevanju. Naj dodamo, da so se prakse v šolah spreminjale. Vse navedene prakse so iz leta 2023, a iz različnih mesecev.

Tabela 2*Pristopi glede uporabe GenUI v šolstvu*

<i>Pristop</i>	<i>Praksa</i>	<i>Vir</i>
Zavračanje oziroma prepovedovanje	Prepoved uporabe GenUI	(Johnson, 2023) (Singer, 2023) (Castillo, 2023) (Browne, 2023)
Sprejemanje in vključevanje	Razviti ustrezne strategije in etične okvire za odgovorno uporabo GenUI in aplikacij za potrebe poučevanja in raziskovanja. To je moč doseči s štirimi strategijami: □ Institucionalno izvajanje etičnih načel in kritični pristop k uporabi GenUI rezultatov. □ Usposabljanje za razumevanje etičnih vprašanj, pristranskosti in zasebnosti. □ Usposabljanje za pisanje ukazov in vrednotenje odgovorov. □ Odkrivanje plagiatorstva in sprememba nalog, tako da GenUI pri tem ne pomaga.	(UNESCO, 2023)
	Prikaz ukazov Gen UI z namenom, da lahko učitelji analizirajo interakcijo kandidata z GenUI in opazujejo kritično razmišljanje in pristope k reševanju problemov. Deljenje ukazov generativnega UI učencem omogoči, da pregledajo delo drug drugega. S tem se spodbuja sodelovalno okolje. Z beleženjem pogovorov z GenUI se lahko pregleda tudi napredek skozi čas.	(OpenAI, 2023c)

<i>Pristop</i>	<i>Praksa</i>	<i>Vir</i>
Sprejemanje in vključevanje	Klepetalni roboti, kot je ChatGPT, se naj v izobraževanju uporabljajo za učenje veščin, ki presegajo osnovno znanje. Učenci naj uporabljajo klepetalne robote za ustvarjanje argumentov, njihovo komentiranje in ponovno pisanje na podlagi kritik. Klepetalni roboti lahko pomagajo učencem, da se osredotočijo na določene vsebine, brez da bi se oddaljili od teme. Učitelji naj pri pisnih nalogah, ki jih učenci pišejo s klepetalnimi roboti, ocenjujejo tako samo nalogo kot ukaz klepetalnemu robotu. Klepetalni roboti lahko izboljšajo poučevanje z ustvarjanjem testnih vprašanj, povzemanjem informacij in s pomočjo pri administrativnih opravilih. Klepetalni roboti lahko povečujejo interaktivnost v razredu in izpostavljajo učence nasprotnim stališčem. ChatGPT lahko zagotovi prilagojeno učno gradivo na podlagi učnih preferenc učencev.	(Heaven, 2023b)
	Dovoljena uporaba pri visokošolskih seminarskih nalogah v manjši meri z navedbo ukaza in odziva GenUI v prilogi.	(Univerza v Novem mestu, 2023)
	Uporaba in povratek k pisnim izpitom. Glavni cilj šolskega sistema ni odkrivanje učencev, ki goljufajo, ampak učiti učence.	(Min, 2023)
	“V prihodnosti bo zato zelo pomembno, da bodo učitelji dovolj dobro poznali novo tehnologijo, da bodo učencem lahko svetovali, kako naj nova pametna orodja uporabljajo smiselno in odgovorno.”	(Dolenc, 2023)
	Profesorji bi morali v učnem načrtu izrecno obravnavati uporabo umetne inteligence in poskrbeti za usposabljanje. Strokovno znanje o GenUI je za študente, profesorje in diplomante ključno za prihodnje zaposlitvene možnosti.	(Murphy Kelly, 2023)

Razvoj dogodkov je pokazal, da je nujno prilagoditi pedagoški proces na univerzah v skladu z novo realnostjo GenUI. Skladno s predavanji in diskusijami na *ENAI Academic Integrity Summer School 2023* (ENAI, 2023) smo na Fakulteti za ekonomijo in informatiko Univerze v Novem mestu pripravili izhodišča za etično uporabo GenUI s strani študentov (tabela 3). Priporočila je senat Univerze v Novem mestu sprejel in jih skupaj s spremnim tekstom objavil na svoji spletni strani.

Tabela 3*Etična uporaba GenUI za študente pri pisanju seminarskih nalog*

<i>Tip UI orodja</i>	<i>Programi</i>	<i>Etično (dopustno)</i>	<i>Neetično (nedopustno)</i>
Izboljševalniki tekstov	Grammarly, Quillbot, Instatext, ChatGPT ...	Jezikovni pregled (npr. pravopisa).	Zakrivanje plagiatorstva.
Prevajalniki	Google Translate, DeepL, ChatGPT in podobni LLM ...	Uporaba pri branju in pri podpori učenju ter pisanju v tujem jeziku.	☐ Reševanje testov in nalog. ☐ Prevajanje z uporabo več jezikov z namenom zakrivanja podobnosti.
Tekstovni transformerji in generatorji	ChatGPT, Bard, Claude2, Llama2, Baidu ...	☐ Podpora pri raziskovanju. ☐ Podpora pri iskanju idej. ☐ Generiranje izhodišč za nadaljnje delo. ☐ Uporaba kot vir z navedbo v virih ter z navedbo ukaza (prompta) in odgovora v prilogi, s katerim se je generiralo tekst.	☐ Uporaba UI generirane vsebine kot lastno delo. ☐ Reševanje domačih nalog, sem. nalog. ☐ Uporaba UI generiranih odstavkov brez sprememb in preverjanja pravilnosti. ☐ Primeri, ko predavatelj prepove uporabo UI orodij.
Ne-tekstovni transformerji in generatorji (slike, programska koda, video, matematika ...)	Midjourney, Dall-E, Code Interpreter, GitHub Copilot, CodeWhisper, StarCoder, StableCode, PolyCoder, ChatGPT, Bard ...	☐ Podpora pri raziskovanju in pri pridobivanju navdiha za začetek dela. ☐ Uporaba kot vir z navedbo v virih ter z navedbo ukaza (prompta) in odgovora v prilogi, s katerim se je generiralo vsebino.	☐ Uporaba UI generirane vsebine kot lastno delo. ☐ Primeri, ko predavatelj prepove uporabo UI orodij.

Vir: https://uni-nm.si/uploads/_custom/Smernice_za_odgovorno_uporabo_orodij_generativne_umetne_inteligence.pdf

5 Razprava

Učence moramo naučiti pravilno uporabljati nove tehnologije, tako da bodo od tega imeli koristi in da se bodo lahko hitreje in učinkoviteje učili. UI plagiarijem bo zagotovo prisoten in ga bo potrebno preprečevati. Poudarek bo potrebno dati ustvarjalnosti, kritičnosti in primerjam. Učni proces ima več aspektov. Ti se razlikujejo glede na vrsto ali smer izobraževanja. Drobnik Koban idr. (2012, str. 18) navajajo: "Učni proces je celota, ki vključuje kognitivne, eksperimentalne in psihomotorične vidike." Kozel

idr. (2020, str. 5) pojasni, da je “učenec glavni konstruktor lastnega znanja” in da učni proces opredeljujejo kriteriji: situacijsko učenje, socialno kognitivni konflikt ter sodelovanje in ne tekmovanje. Da se je z uporabo medijev učiteljeva pozicija spremenila, je ugotovil že Blažič (1997, str. 204), ki je zapisal: “V pogojih uporabe učnih medijev učitelj sprejema nove funkcije, kot so npr. organizatorska, iniciatorska, animatorska, komentatorska, katalizatorska, kreatoriska itd.”. Glede prenosa učne vsebine Blažič (2000, str. 123) pravi, da se “mediji pojavljajo kot prvina šolske komunikacije med učiteljem in učencem” in “omogočajo transfer in posredovanje znanja”.

Danes lahko rečemo, da je GenUI nov medij. Novo je predvsem to, da ta medij prvič generira vsebine in odgovarja na vprašanja ter rešuje naloge. Zato bo potrebno preverjanje znanja pregledati na novo in sprejeti odločitve. Zagovarjamo preverjanje znanj brez uporabe GenUI orodij.

Omejitve raziskave

Področje generativnih UI modelov je od novembra 2022, ko je bil objavljen dostop do ChatGPT, dobesedno eksplodiralo. Med podjetji poteka tekma ne samo za tržišče in predplačniške uporabnike, ampak tudi za prevlado na področju spletnih iskalnikov, kjer še kraljuje Google. Prispevek obravnava pregledane vire do 20. 10. 2023. Ni običajno, da se v prispevek napiše datum, a se obravnavano področje trenutno spreminja na dnevni bazi. Videti je, kot da vrh Hype krivulje (slika 2) še vedno ni dosežen. Pregled literature ima pomanjkljivost tudi v tem, da nismo našli širšega, sistematičnega in znanstvenega pregleda področja. Enostavno gre za novo tehnologijo in predvsem nove načine uporabe te tehnologije. V prispevku se nismo dotaknili nevarnosti, ki jih prinaša uporaba GenUI.

Predlog za nadaljnje raziskovalno delo

Za nadaljnje raziskovalno delo bi priporočili ponovni pregled področja in predvsem identifikacijo dobrih praks pri uvedbi GenUI v šolstvu, ki se bodo sčasoma oblikovale. Ne gre pozabiti tudi na pregled vplivov na vsakodnevno življenje. Pri tem bodo primarne raziskave v obliki anket čez nekaj časa lahko dale pravo sliko vpliva GenUI. Ta trenutek, ko je uporaba še omejena in delno poznana, lahko takšne raziskave podajo samo parcialno sliko.

Razvoj gre hitro naprej in generativni jezikovni modeli se izboljšujejo ter postajajo bolj natančni. Heaven (2023a) je navedel lastnosti GPT-4, ki ga je podjetje OpenAI predstavilo 14. 3. 2023. GPT-4 prekaša ChatGPT tudi na človeških testih, vključno z enotnim odvetniškim izpitom (angl. *Uniform Bar Exam*), kjer se GPT-4 uvršča v 90. percentilo, ChatGPT pa v 10. percentilo, in testih biološke olimpijade, kjer se GPT-4 uvršča v 99. percentilo, ChatGPT pa v 31. percentilo. OpenAI trenutno ne razkriva ničesar o GPT4 modelu, ne števila naučenih parametrov, ne potrebne računalniške moči in ne tehnik učenja.

Kot pri vseh novih tehnologijah, ki so imele vpliv na šolski sistem, tudi tu veljajo načela Johna Amosa Comeniusa, avtorja knjige *The Great Didactic* (izdana 1649), da

mora biti cilj izobraževanja učencem privzgojiti moralne in etične vrednote ter jih naučiti praktičnih spretnosti, ki bodo uporabne v njihovem prihodnjem življenju. Prav tako je pri učencih pomembno vzbuditi ljubezen do učenja, kar bo vodilo k vseživljenjskemu prizadevanju za znanje.

6 Zaključek

GenUI modeli so dosegli v zadnjem letu izjemen napredek. Širši javnosti se zdi, kot da je prišlo do revolucije pri uporabnosti UI. GenUI modeli sedaj bolje upoštevajo kontekst podanih navodil in ustvarjajo večinoma pravilne odgovore, in to ne samo na enem ozko domenskem področju, temveč na veliko področjih.

Uporaba GenUI modelov močno spreminja tudi področje izobraževanja. Predstavili smo več pomislekov in razmišljanj avtorjev, ki so se spraševali o smiselnosti domačih in seminarskih nalog. Ugotavljanje UI plagiarizma trenutno še ne daje 100-odstotno pravih odgovorov in se zato postavlja vprašanje, če bo to sploh kdaj možno, glede na to, da programi za preverjanje plagiarizma zaostajajo za razvojem GenUI modelov. V članku smo predstavili predloge različnih avtorjev glede tega, kakšne pristope kaže v šolstvu uporabiti ob hitrem razvoju GenUI modelov. Za časa pisanja tega prispevka generalno sprejete taktike še ni in v bistvu poteka preizkušanje različnih pristopov.

Koristi GenUI so velike. S pravilno uporabo nam lahko zelo poveča učinkovitost pri vsakdanjih opravilih in tudi pri izobraževanju. Zagotovo se bo uporabljala tudi pri goljufanju, ki ga lahko minimiziramo z več pristopi. Na vprašanje, ali GenUI uporabljati, lahko podamo odgovor, da je GenUI tukaj in je novo orodje. Tudi razmisleki o izločitvi in prepovedi so bili kratkovidni. Tehnologijo moramo izkoristiti. Prej ko jo bomo sprejeli v izobraževalnem procesu in vsakdanjem življenju, boljše bo. Naslednja prelomna točka bo, ko ne bomo več ločili človeško in UI napisanega teksta. To je tudi točka, ko bo področje izobraževanja ponovno na preizkušnji in bo, kot kaže, sledila nova paradigma v izobraževanju. Kljub vsemu nikakor ne smemo pozabiti Aristotelovega stavka, da izobraževanje ni samo sprejemanje informacij, temveč predvsem razvijanje sposobnosti mišljenja. Z GenUI bomo pri sprejemanju informacij veliko hitrejši, a zato brez razvijanja sposobnosti mišljenja nič pametnejši. Oboje skupaj pa ima velik potencial za napredek na vseh področjih.

Igor Makovec, MA

Generative AI as a New Paradigm in Education and in Life

In recent years, we have seen revolutionary advances in the world of generative artificial intelligence (GenAI) models. These models, such as ChatGPT, are changing our perception of what AI can do. They are also changing the way we interact with computers. However, with these growing capabilities come a number of challenges and issues that concern both the economy and the education system.

In this paper, we focus on the impact of GenAI on different areas, from business to education. Our aim was to analyse how this technology can be integrated into everyday life and the education system. Based on a review of various sources and the reflections of different authors, we present the views on GenAI that have emerged up to 20 October 2023.

In reviewing the available sources, a qualitative descriptive method was used to describe the situation, and a compilation method to summarise the results of foreign scientific studies. A desktop research technique was used to systematically collect and analyse secondary sources. The relevant sources selected for the article are those which best cover the subject area. A list of best practices was compiled using an inductive method, which enabled us to recommend individual practices for general use. The survey ran from March to October 2023, and as the field is evolving extremely rapidly, most of the sources used were published close to the last survey date.

Gartner (2023) states that GenAI has the potential to fundamentally change the existing economy and society. It compares it to the emergence of the Internet and, even earlier, the invention of electricity. GenAI could become a competitive advantage and a differentiator. It can automate repetitive and tedious tasks and generate new insights, ideas and innovations. A look at the Google hits (Figure 1) shows that interest is very high. The growing interest in artificial intelligence coincides with a rising interest in generative AI. The interest in AI has risen in parallel with interest in GenAI, and the rise continues, indicating that the technology is spreading. The report "What's New in Artificial Intelligence from the 2023 Gartner Hype Cycle" (Gartner, 2023) states that GenAI has reached the peak of expectations and will be followed by a downward trend characterised by the limitations of GenAI. The report also sees two paths leading to an even stronger AI; one through innovation driven by GenAI, and the other being the innovation that extends the capabilities of GenAI.

In reviewing the sources, we narrowed our focus to two fields of GenAI impact: the area of daily life and the area of education. As the area of daily life covers the entire life cycle, we have focused our investigation on the impact on the industry. Consequently, its effect in this area has implications in all sectors.

Based on text commands and optionally added files or entered web links, GenAI generates text, images and graphs for a variety of requirements, although it is less capable than a human being. It already achieves human-level performance in many areas. OpenAI (2023a) has conducted tests with a variety of publicly available academic and professional texts. In a simulated bar exam, for example, ChatGPT-4 was in the top 10% of exam takers. Figure 3 shows the progress by the generation of GPT models. The accuracy of 100% means that the answers match the ideal human answers. The most controversial area is hallucination, where GenAI can produce a text that looks plausible and reads well, but is factually incorrect. This property of GenAI models makes it necessary to check the results – the answers – and it is essential to be familiar with the domains in which GenAI is used.

At the time of the above survey, McKinsey & Company (2023) conducted a global survey ($n = 1,684$) on the use of GenAI in various vertical industries (Figure 5). The results of this survey show that a third of all respondents stated that their organisations already use GenAI regularly for at least one function. A total of 40% of the respondents stated that they will invest more in GenAI. The most common business functions where

generative AI is used are the same ones where the use of AI is most prevalent overall: marketing and sales, product and service development, customer care and back-office support. This indicates that companies are using new tools in the areas where they will bring the greatest benefit. In addition, 79% of the respondents said that they had come into contact with AI at least once, either at work or outside work. A total of 22% confirmed that they regularly use GenAI in their work.

We have summarised several sources on the impact of GenAI on different business areas: edX (2023), GB Advisors (2023), Guedes (2023), Mccullough (2023), Senica (2023), and Statista (2023), all of which highlight areas of the GenAI impact. To highlight the edX (2023) survey, the managers stated that by 2025, 49% of the skills of today's workforce will be inadequate and that their organisations will lose 56% of entry-level skills in the next 5 years. The majority, or 79% of managers, also believe that they will be unprepared for their future roles if they do not learn how to use AI.

We specifically analysed the impact on education. We have observed that, despite the digital transformation and Industry 4.0, education is still based on basic learning technologies in the form of lectures supported by multimedia tools. Today, GenAI represents an opportunity to change the entire learning process. The impacts on the education system are many, ranging from supporting lecturers to taking on the role of a personal tutor for students. Due to the scale of the impact, we have paid attention to two areas: plagiarism and recommendations for the school system.

In the area of plagiarism, ethical issues arise as well, such as the bias of GenAI and the authorship of the generated text. GenAI-generated texts should not be used as our own work and cannot be cited as a source because the texts are not generated by GenAI itself, but are created in response to our input (prompt). At the International Conference on Machine Learning ICML (ICML, 2023), a guideline for the use of GenAI-generated text was announced: "Papers that include text generated by a large-scale language model (LLM) such as ChatGPT are prohibited unless the generated text is presented as part of the experimental analysis of the paper." However, no program for detecting AI plagiarism is 100% reliable, although at least according to the providers' own statements they have come very close to this figure. The number of AI-generated texts will increase over time, and it will become increasingly difficult to distinguish text written by AI from text written by humans. The fact that software detection of AI plagiarism does not work 100% was established by Sankar Sadasivan et al. (2023). In a large-scale study with practical examples, they have discovered that even state-of-the-art AI plagiarism detection software cannot detect AI-generated text in practical scenarios, as it can quickly be fooled by paraphrasing the text. They point out that it is necessary to balance detection. A high proportion of false positives leads to innocents being blamed and reduces the credibility of recognition programs.

However, teachers are not completely powerless to recognise AI plagiarism.

Even today, it is possible to recognise suspicious AI-generated texts based on the following criteria:

- The candidate's writing style suddenly changes.
- The text has a higher quality level than would be expected from the candidate.
- The content is not relevant because the candidate has not checked the facts. It is a typical hallucination of the generative AI models.

- *The sources are non-existent or do not summarise the text.*
- *The text perplexity is lower in AI-generated texts.*
- *Sentence variability (burstiness) is lower in AI-generated texts.*

With regard to recommendations for the school system, we have systematically compiled various recommendations in Table 2, ranging from rejection and prohibition of GenAI to acceptance and inclusion. The developments have shown that there is an urgent need to adapt the pedagogical process at universities to the new reality of GenAI. Based on the presentations and discussions at the ENAI Academic Integrity PhD Summer School 2023 (ENAI, 2023), the Faculty of Economics and Informatics of the University of Novo mesto has developed a baseline for the ethical use of GenAI by students (Table 3). We have defined the ethical and unethical use for different types of GenAI tools: text enhancers, compilers, text transformers and generators, and non-text transformers and generators. We have published a document and informed our students about it.

The field of generative AI models has exploded since November 2022, when free access to ChatGPT was announced. There is a competition among companies not only for market share and prepaid users, but also for dominance in the search engine space, where Google still has the upper hand. The drawback of our literature research is that we have not found a broad, systematic and scientific overview of the field, as the technology is simply too new. For further research, we recommend a review of the field and in particular, identifying good practices in the implementation of GenAI in education. Primary research in the form of surveys will, over time, be able to give a true picture of the impact of GenAI.

The aim of this paper has been to highlight the potential impact of GenAI on everyday life, through its impact on industry and on education. Examining the impact on industry, we have addressed many potential areas that have been covered by various authors. Our study mainly focuses on education. We present a number of concerns and considerations from authors who have questioned the relevance of homework and seminar assignments. AI plagiarism detection does not currently provide 100% accurate answers and therefore the question is whether this will ever be possible as plagiarism detection programs lag behind the development of the GenAI models. In this study, we present several suggestions from various authors as to what approaches should be used in education given the rapid development of the GenAI models. At the time of writing this study, there is no universally accepted tactic, and in fact various approaches are being tested.

The benefits of GenAI are enormous and, if used correctly, it can greatly increase our efficiency in everyday tasks as well as in education. Undoubtedly, it will also be used for cheating, but that can be minimised through various approaches. When asked whether GenAI should be used, we can answer that GenAI is here and it is a new tool. The scraping and banning considerations seem to be short-sighted. We need to take advantage of this technology. The sooner it is used in the education process and in our daily lives, the better. Nevertheless, we must never forget Aristotle's dictum that education consists not only of absorbing information, but above all of developing the ability to think.

GenAI makes us much faster at absorbing information, but it does not make us smarter since it does not develop our ability to think. We should bear in mind that only these two abilities combined have a great potential for progress in all areas.

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Didactica Slovenica – Pedagoška obzorja, znanstvena revija za didaktiko in metodike, objavlja članke, ki so razvrščeni v kategoriji: znanstveni članek ali strokovni članek.

Kategorijo članka predlaga avtor, končno presojo pa na osnovi strokovnih recenzij opravi uredništvo oziroma odgovorni urednik. Objavljeni članki so recenzirani.

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5. Znanstveni in strokovni članki morajo imeti povzetek v slovenskem (od 1.000 do 1.200 znakov s presledki) in v angleškem jeziku. Povzetek in ključne besede naj bodo napisani na začetku članka. Priložiti je treba tudi razširjeni povzetek (10.000 znakov s presledki) v angleškem jeziku.
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 - Za članke v zbornikih: priimek in ime avtorja, leto objave, naslov članka, podatki o knjigi ali zborniku, strani. Primer: Razdevšek Pučko, C. (2013). Usposabljanje učiteljev za uvajanje novosti. V: Tancer, M. (ur.). Stoletnica rojstva Gustava Šliha. Maribor: Pedagoška fakulteta, 234–247.
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Za vsa dodatna pojasnila ter informacije glede priprave in objave člankov, za katere menite, da niso zajeta v navodilih, se obrnite na glavnega in odgovornega urednika na elektronski naslov chief.editor@didactica-slovenica.si. Za splošnejše informacije ter tehnično pomoč pri pripravi članka pa se lahko obrnete na uredništvo oziroma na naš elektronski naslov info@pedagoga-obzorja.si.

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