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Assessing primary school pupils' knowledge of and behaviour concerning waste management

Ocena znanja in delovanja osnovnošolcev glede ravnaja z odpadki

Iztok Tomažič[a]* and Tatjana Vidic[b]

[a] University of Ljubljana, Biotechnical Faculty, Department of Biology, Večna pot 111, SI-1001 Ljubljana, Slovenia
[b] Simon Jenko Primary School Kranj, Ulica 31. divizije 7a, 4000 Kranj, Slovenia
*correspondence: iztok.tomazic@bf.uni-lj.si

Abstract: Topics involving waste management and other environmental issues are scarce in Slovenian curricula, and mainly covered during the first and second cycles of the nine-year compulsory school (pupils aged 6–12) (Učni načrt: program osnovnošolskega izobraževanja, 1998). In the present study we investigated how well pupils in Slovenia aged 10–15 (second and third cycles of the compulsory school) have developed their competences for sound waste management behaviour. We found that they seldom act in accordance with the recommendations for waste treatment and disposal that they learn in school. We also found that third cycle pupils (8th and 9th grade, i.e. aged 13–15) are less willing to take pro-environmental action. Hence these pupils should be engaged in a learning process through which they would improve their knowledge about waste management, and become more willing to take pro-environmental action. In order to facilitate a change in pupils' behaviour and raise their environmental awareness, we propose that environmental education should be an integral part of the curriculum throughout all three cycles of compulsory education.

Keywords: pro-environmental action, waste management, waste, compulsory education.

Izvleček: Vsebine, ki vključujejo ravnanje z odpadki in drugimi okoljskimi problemi, so v slovenskem učnem načrtu za naravoslovje in biologijo skopo zastopane (Učni načrt: program osnovnošolskega izobraževanja, 1998). V večji meri so del učnih načrtov prve in druge triade devetletne osnovne šole (starost učencev 6–12 let). Z raziskavo smo želeli ugotoviti, kako slovenski učenci stari od 10 do15 let (druga in tretja triada) ravnajo z odpadki (ločevanje, zbiranje in odlaganje odpadkov). Ugotovili smo, da učenci le z nekaterimi odpadki ravnajo tako, kot zahtevajo priporočila ravnanja z odpadki, o katerih so se učili v šoli. Ugotovil smo še, da so učenci tretje triade (8. in 9. razred; 13–15 let) manj pripravljeni delovati pro-okoljsko kot njihovi vrstniki iz druge triade. Učenci bi morali biti vključeni v učni proces, preko katerega bi lahko usvojili dodatna znanja o ravnanju z odpadki in bili (bolj) pripravljeni delovati pro-okoljsko. Za spreminjanje delovanja učencev in dviga njihove okoljske zavesti, predlagamo, da se okoljske vsebine vključijo v izbrane učne načrte vseh triad.

Ključne besede: pro-okoljsko delovanje, ravnanje z odpadki, odpadki, osnovnošolsko izobraževanje.

Introduction

EU member states have committed themselves to reducing their waste output, and making a step toward an effective waste pick-up, disposal, and recycling system between 2011 and 2020 (COM(2010)235). Slovenia is one of six EU members in which the proportion of municipal waste dumped in landfills increased in between 1995 and 2007. There is evidence that in terms of waste management Slovenia is lagging behind the more developed EU countries (http://kazalci.arso.gov.si).

Topics involving waste management and other environmental issues are scarce in Slovenian curricula, and mainly covered during the first and second cycles of the nine-year compulsory school (pupils aged 6–12). Although it has been suggested that the most appropriate age to foster environmental concern and action in students is 13 years (Kellert 1985), this appears to have been overlooked when science and biology curricula were designed in Slovenia (Učni načrt: program osnovnošolskega izobraževanja 1998). Leeming et al. (1995) argue that it is important that environmental education start at an appropriate age, since early attitudes and knowledge shape the later thinking of adolescents and adults. Younger pupils have a longer period to influence environmental quality (Leeming et al. 1995), and may serve as effective agents to promote environmentally responsible behaviour in others (Leeming et al. 1995, Evans and Gill 1996). Several authors also report about gender differences in environmental attitudes and behaviours (see Zelezny et al. 2000). Research on environmentalism and gender has been limited in the past. Howewer, Zelezny et al. (2000) find that girls express greater proenvironmental attitudes than boys. In theirs study girls reported stronger overall concern for the environment, and personal responsibility for improving the environment. Also, girls expressed greater proenvironmental attitudes than did boys on concern about trash, interest in recycling, and interest in school recycling.

Pupils familiarity with environmental issues is vital. Conceptions of the environment are likely to be influenced by television and other external sources as well as formal schooling (Chan 1998, Rickinson 2001, Kobierska et al. 2007, Shepardson 2007). Beside school educational programmes, government has an important role in informing public about environmental issues e.g. waste management, too (Chung and Poon 1996). In Slovenia the latter is reflected in various governmental projects which aim to promote environmentally friendly behaviour in people. For a more environmentally responsible behaviour environmental issues should be addressed through education (Chan 1998). Lester et al. (2006) provide evidence that pupils with better knowledge of science are more environmentally active than those whose knowledge is poor. However, knowledge itself could be a precursor of some pro-environmental behaviours (e.g. Hornik et al. 1995), but research has unconvincing data supporting this. Kuhlemeier et al. (1999) find that relationships between knowledge and pro-environmental behaviour or attitudes and behaviour are extremely low. Therefore, pupils should be educated in a way that would raise their environmental awareness and improve their knowledge so that they could make informed and responsible decisions as adults (Fernández-Manzanal et al. 2007, Littledyke 2008). They should also be made aware that environmental problems result from human behaviour, and that solving them requires a profound change in the behavioural paradigm (Zelezny and Schultz 2000).

If pupils are to acquire the competences that will help them to develop pro-environmental behaviour (which also includes sound waste management practices) they need a solid knowledge base (Jensen 2002) and a positive attitude toward the environment (Kraus 1995). Beside that environmental education should also stream into an active role-taking in the protection, and not into the 'use' of nature and the environment (Bogner 1999).

In the present study we investigated how well pupils in Slovenia aged 12–15 (second and third cycles of the compulsory school) have developed their competences for sound waste management behaviour.

Studies about waste management behaviour of children and adults could provide useful knowledge for policy development in waste management.

The study addressed four questions:

1. Do Slovenian primary school pupils know which waste is hazardous to the environment and organisms if disposed of in the nature?
2. Do pupils follow the recommendation of (non) hazardous waste disposal at home (Uradni list RS, št. 45/2009)
3. How pupils behave if they come across any waste outdoors?
4. Where do they get the most information about the influence of hazardous waste on living organisms and the environment?

Method

Participants

A total of 215 pupils (aged 10–15) from one school participated in the study, which was conducted in the school year 2009/10. They attended the 5th (14.9%), 6th (24.7%), 7th (19.1%), 8th (18.6%), and 9th (22.81%) grade, respectively. There were 49.8% male and 50.2% female pupils.

Instrument

Leeming et al. (1995) stress that there is no single and widely recognised scale for measuring children's attitudes toward and knowledge of a broad range of environmental issues. In mid-1990s, meaningful comparisons across studies about environmental attitude and knowledge were impossible due to a lack of suitable instruments. For this reason some instruments were developed such as CHEAKS and NEP (Leeming et al. 1995, Dunlap et al. 2000). In this study we did not use any of the above-mentioned scales, since we focused on the pupils' behaviour and their knowledge about waste management. Although the Leeming's (1995) scale includes statements about pollution and recycling it is too generalised to suit the needs of our research. We therefore designed our own questionnaire which consisted of 4 parts.

First, the pupils were required to rate waste as predominantly hazardous or non-hazardous on a 5-point Likert scale, with the items rated as follows: 1 – *not at all hazardous*, 2 – *not hazardous*, 3 – *not sure if hazardous*, 4 – *hazardous*, and 5 – *very hazardous*.

Then the pupils were instructed to indicate how they usually dispose of waste (e.g. packaging, fruit skins, used vegetable oil, motor oil, batteries, tins containing lacquers, varnishes or similar agents, bottles of aggressive detergents, and antibiotics) at home. They were asked to select the most appropriate of the six offered possibilities: "*We put waste in a bin for mixed waste*.", "*We separate waste, and then put each fraction in an appropriate waste bin*.", "*We dispose of waste when the waste collection company collects hazardous waste*.", "*We do nothing, we leave the waste in the basement." "We put waste in a compost bin.*", "*We take waste to a waste collection and treatment centre*." The pupils were also given the option of describing an alternative way of waste disposal.

In the third part the pupils wrote what they did if they saw discarded waste (candy wrappers, old tyres, paper handkerchiefs, skin fruits or puddles of motor oil) outdoors. They were asked to s**elect** one of the following five answers that best described their behaviour: "*I do nothing, I just walk on.*", "*I pick up the waste and put it in a bin. I also contact the waste disposal company and tell them about the waste*.", *I feel shocked to see what people do*.", "*I do nothing, it will eventually decompose*.", and "*I have never seen such things being disposed of in the nature*."

In the fourth part we asked the pupils where they usually get the most information about the impact of waste on the environment, and gave them the following 5 possibilities: *Home*, *School*, *TV*, *Books*, and *Internet*.

Results

Pupils' evaluations of waste hazardousness

Figure 1, which presents the pupils' waste hazardousness ratings, shows that they found fruit skins, stable litter, and decomposing wood as non hazardous to the environment and organisms. They could not decide, however, whether paper handkerchiefs and paper bags are hazardous or not. They also correctly rated candy wrappers, tins, plastic bags, damaged detergent bottles, antibiotics, batteries and motor oil as hazardous if disposed of outdoors.

We found statistically significant differences in the evaluations of waste hazardousness for fruit skins, batteries and antibiotics between pupils of different grades. The difference for fruit skins on account of 5th grade pupils was ($\chi 2 = 10.22$, df = 4, p = 0.037), for batteries on account of 6th grade pupils was ($\chi 2 = 37.34$, df = 4, $p < 0.001$), while for antibiotics it was ($\chi 2 = 9.59$, df = 4, p = 0.048) on account of 9th grade pupils. 5th grade pupils rated fruit skins higher, 6th and 7th graders rated batteries, and 9th grade pupils rated antibiotics lower in comparison to other pupils.

When we compared pupils' perceptions of waste hazardousness according to gender, we found that girls on average rated paper handkerchiefs, paper bags, tins, and plastic bags as more hazardous to the environment than boys (Tab. 1).

Pupils' reports about how they dispose of various waste

In addition to which waste pupils perceive as an environmental hazard, we also wanted to find if they behave in an environmentally responsible way. We therefore asked them how they disposed of particular kind of waste at home. Among six possible options they were asked to chose the one they felt best described their behaviour. They were also allowed to provide their own answer. We categorised their answers in 2 groups: *Proper* and *Improper* waste disposal. For example, a case of proper disposal of a plastic yogurt cup would be to put it in a bin for plastic waste, whereas it would be improper to put it in a bin for mixed waste.

We found that pupils from 5th to 9th grades follow the recommendation of nonhazardous waste disposal (Uradni list RS, št. 45/2009). Over a half of the pupils treat fruit skins as recommended. The number of those who would dispose of a yoghurt

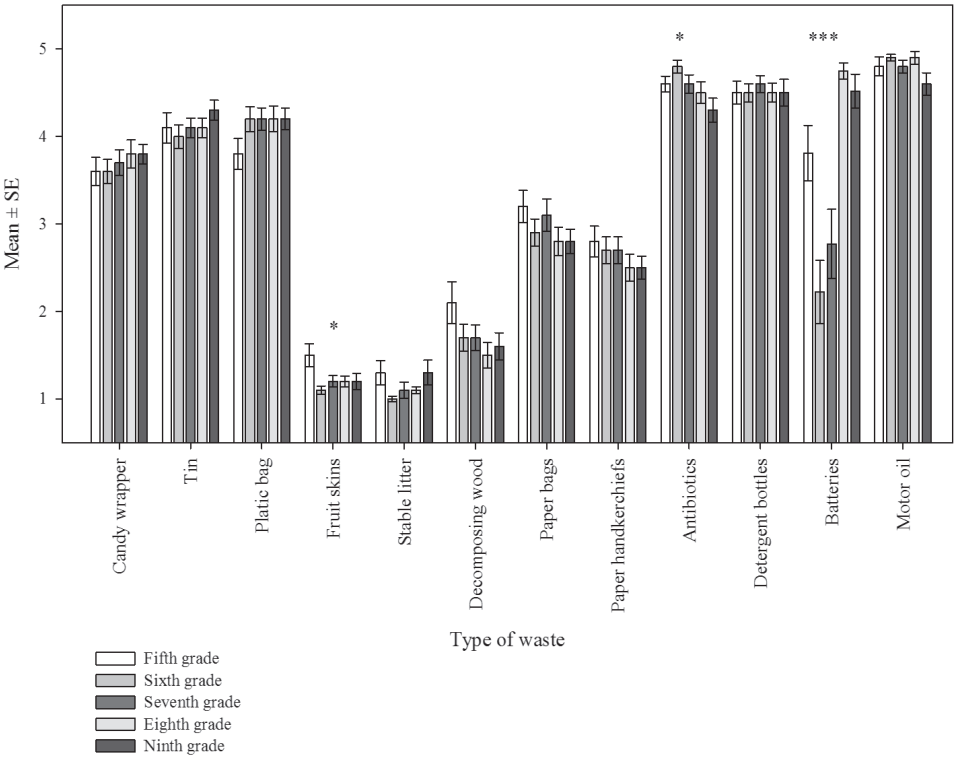

Figure 1: Pupils' ratings of waste hazardousness.
Slika 1: Ocene učencev o nevarnosti odpadkov.

Table 1: Perception of waste as an environmental hazard – gender differences.
Tabela 1: Ocenjevanje nevarnosti odpadkov glede na spol učencev.

	Boys			Girls			Mann-Whitney U	
Waste	Mean	SD	N	Mean	SD	N	Z	p
Paper handkerchiefs	2.4	0.952	98	2.8	0.900	99	–3.006	0.003
Tins	4.0	0.845	99	4.2	0.754	100	–2.283	0.022
Plastic bags	4.0	0.920	99	4.3	0.852	99	–2.477	0.013
Paper bags	2.7	1.015	96	3.2	0.986	99	–3.235	0.001

cup in a proper way is lower, i.e. only 42% of the pupils followed the rules of waste disposal.

The most frequent improper way of disposing of yogurt cups was to put them in a bin for mixed waste (Tab. 2). In addition, data for organic waste show that such waste often ends up in a bin for mixed waste, although the percentage of pupils who stated that they composted organic waste should also be taken into consideration.

We also found that 50% of the pupils from 5th to 9th grades would normally observe the rules for the disposal of motor oil and batteries. With regard to other waste, we found that fewer than 50% of the pupils know how to treat and dispose of waste properly. Also, the percentage of pupils who do not know how to dispose of hazardous waste should not be underestimated (Tab. 2).

Data about the disposal of vegetable oil show that only 14.4% pupils observe disposal recommendations. Other pupils reported that they disposed of oil by putting it in a bin for mixed waste or a compost bin, which is not in accordance with the recommendations. More than 30% of the pupils reported pouring vegetable oil in a drain. Some reported not knowing how they dispose of such waste at home (Tab. 2). Over 30% of the pupils did not know how to dispose of motor oil. On the other hand, almost 50% of them reported that they treated this waste as recommended. We found that pupils follow the rules of used battery disposal, regularly disposing of such items when their local waste collection company organises a hazardous waste collection, or even taking used batteries to a waste collection and treatment centre themselves (Tab. 2). On the other hand, many pupils improperly dispose of tins containing lacquers and varnishes (57%), and bottles of aggressive detergents (61%). This waste often ends up in a bin for mixed waste or in a plastic fraction bin (Tab. 2). With regard to antibiotics, the pupils reported that they put them in a bin for mixed waste (which they should be discouraged from doing), dispose of them when their local waste collection company collects hazardous waste, or even take them to a waste collection and treatment centre (behaviour which should be encouraged) (Tab. 2).

Pupils' role in the environmental protection

We asked the pupils what they do when they come across litter (candy wrappers, paper handkerchiefs, fruit skins, old car tyres, and motor oil) in the nature. According to our results, some of them adopt an proactive approach to environmental protection.

While most pupils will pick up the candy wrapper and put it in a bin (Fig. 2), this behaviour decreases with age. Pupils from the second cycle (grades 5–6) will more readily pick up a discarded wrapper than their colleagues from the third cycle (grades 7–9), with pupils of the 7th grade being an exception. While the percentage of children who would do nothing is not negligible, they mainly come from the last cycle (grades 8–9). Some pupils reported that they feel bad when they see litter lying around.

Figure 3 shows how pupils behave when they see a discarded paper handkerchief. These results are comparable to the results for the candy wrapper. 5th grade pupils are most likely to pick it up and put it in a bin, while 9th and 8th graders are the most likely to ignore it. As many as 33% of 9th and 31% of 6th graders reported that they would do nothing with a discarded handkerchief because it would decompose anyway. The answers

Table 2: Ways of waste disposal for some (non)hazardous waste.
Tabela 2: Načini ravnanja z nekaterimi (ne)nevarnimi odpadki.

Ways of waste disposal	**Nonhazardous waste**		**Hazardous waste**					
	Yoghurt, pudding cups etc.	**Fruit skins**	**Vegetable oil**	**Motor oil**	**Batteries**	**Tins of varnish or coating**	**Bottles of aggressive detergents**	**Antibiotics**
We put waste in a bin for mixed waste.	52.1	40.0	13.5	6.0	9.8	25.1	22.3	25.6
We separate waste, and then put each fraction in an appropriate waste bin.	**42.3**	**1.4**	5.1	7.0	20.5	29.8	35.8	14.9
We dispose of waste when the waste collection company collects hazardous waste.	0.9	0	**8.4**	**26.0**	**40.0**	**23.3**	**22.8**	**25.6**
We do nothing. We leave the waste in the basement.	0.9	0	1.9	6.5	0.5	1.4	1.9	1.4
We put waste in a compost bin.	0.5	**55.3**	14.9	0	0	0.5	0.5	0
We take waste to a waste collection and treatment centre.	**0.5**	0	**6.0**	**20.9**	**24.2**	**10.7**	**7.0**	**18.6**
I don't know how to treat waste.	2.8	2.3	17.7	30.2	5.1	9.3	9.8	13.0
We pour it down the drain.	0	0	32.6	0.9	0	0	0	0
We feed it to the animals.	0	**0.9**	0	0	0	0	0	0
We do not have such waste.	0	0	0	2.3	0	0	0	0.9

The percentage of pupils (N_{ALL} = 215) who opted for a proper way of waste disposal is printed bold.
Odstotek učencev (N_{VSI} = 215), ki je izbral pravilnen način ravnaja z odpadki, je zapisan s krepkim tiskom.

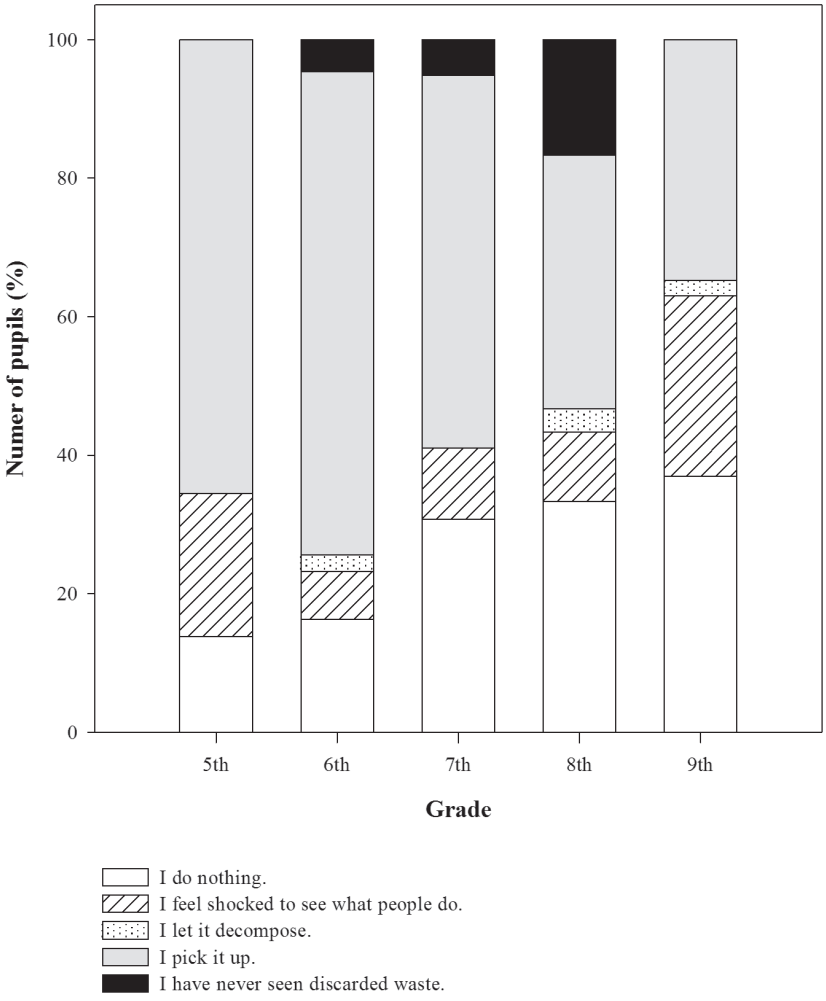

Figure 2: What do children do when they see a discarded candy wrapper outdoors?
Slika 2: Kako ravnajo učenci, ko opazijo zavržen ovitek bonbona na prostem?

of 7th grade pupils are almost equally distributed between "*I do nothing*.", "*I pick it up*." and "*I feel bad about it*."

Figure 4 shows how children react when they come across discarded fruit skins in the street or in the nature. Almost 80% of the 6th graders do nothing, since they correctly assume that the fruit skin will decompose. This result is expected, since these pupils learn about how to prepare compost and which waste can be composted. Pupils from the third cycle should be familiar with composting since they learn about this in the 6th grade. Again, 9th and 8th graders dominate in that they would do nothing if they saw discarded fruit skins, while 5th graders are the most likely to clean up the mess. The percentage of pupils who feel disgusted at the behaviour of the others is less than 15% for each grade.

The data for car tyres show that pupils are aware that disused car tyres should be removed and disposed of properly (Fig. 5). Only some 5th grade pupils believe that car tyres can decompose

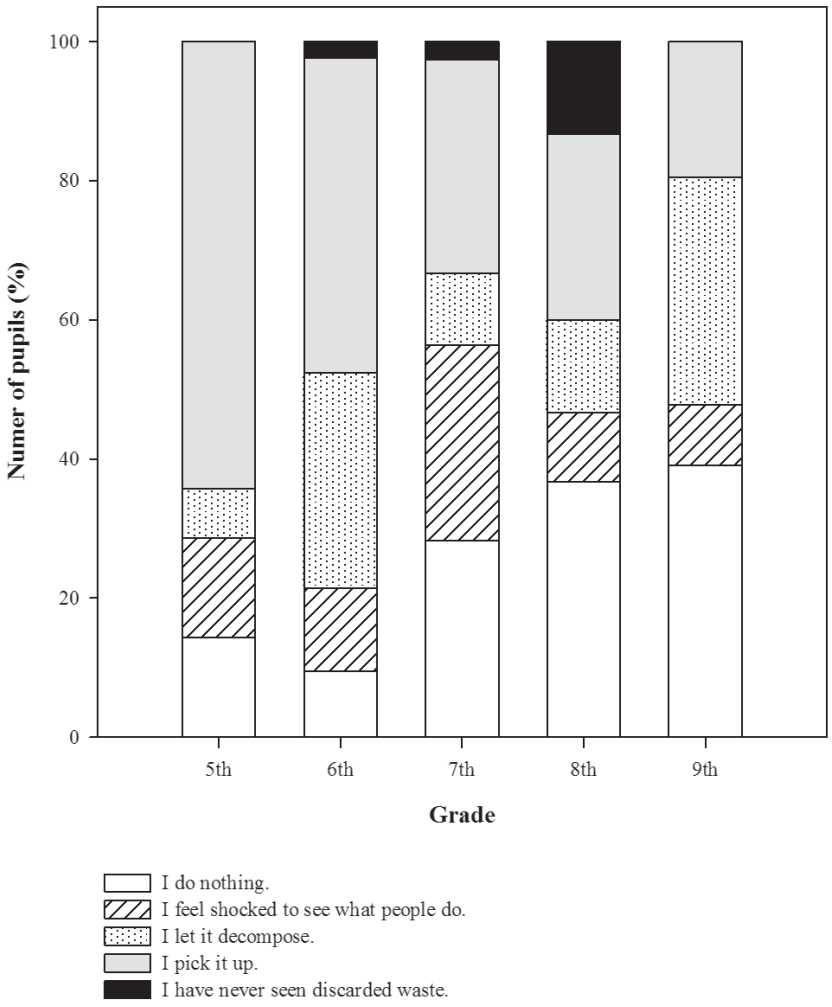

Figure 3: What do children do when they see a discarded paper handkerchief outdoors?
Slika 3: Kako ravnajo učenci, ko opazijo zavržen papirnat robček na prostem?

by themselves. Also, some 5th graders believe that motor oil decomposes. Data shows that there is a considerable percentage of pupils from the 8th and 9th grades who would not take action to protect the environment. These pupils usually just feel disgusted at what other people do, or simply do nothing. Some pupils would contact the waste disposal company and tell them about the waste, this behaviour decreases with age.

The pupils' source of environmental information

The pupils stated that the major sources of environmental information for them were TV documentaries, their teachers in school, and the internet (Fig. 6). Fewer pupils learn about environmental care from their parents or read about it in books.

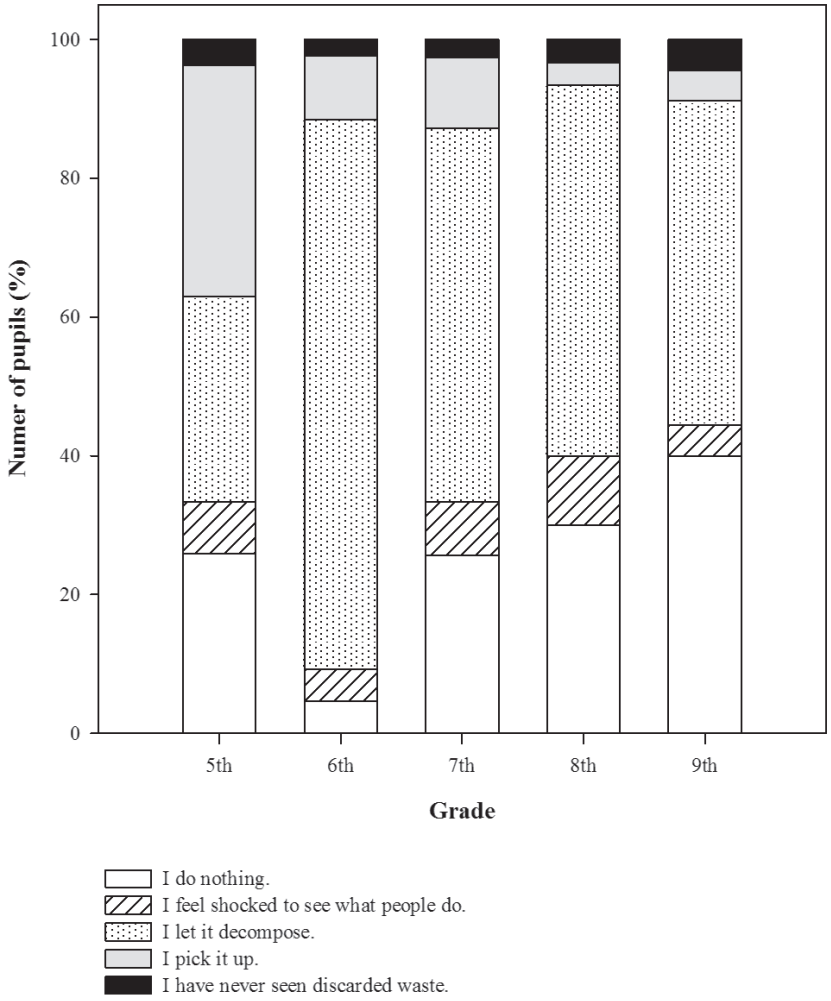

Figure 4: What do children do when they see discarded fruit skins outdoors?
Slika 4: Kako ravnajo učenci, ko opazijo zavržene olupke sadja na prostem?

Discussion

Results of the study show that although pupils know which waste is hazardous their knowledge about the disposal of certain non-hazardous or hazardous waste at home is limited. Waste such as plastic yogurt or pudding cups often ends up in a container for mixed waste. Only 42% pupils state that they actually separate waste, although most of them should do so. These findings could be generalised to include other packaging (meat pâtés, butter, chips, coffee, etc.), which yields itself to the conclusion that children prefer collecting all waste in the mixed-waste container than separating it by fractions, which is easier and faster (Matsumoto 2011).

We find that over 50% of the pupils collect organic waste (e.g. fruit skins) in a compost bin. However, four out of ten pupils will still put such waste in a bin for mixed waste (Tab. 2). Parents play a crucial role in teaching their children about waste treatment at home. We feel that if parents do

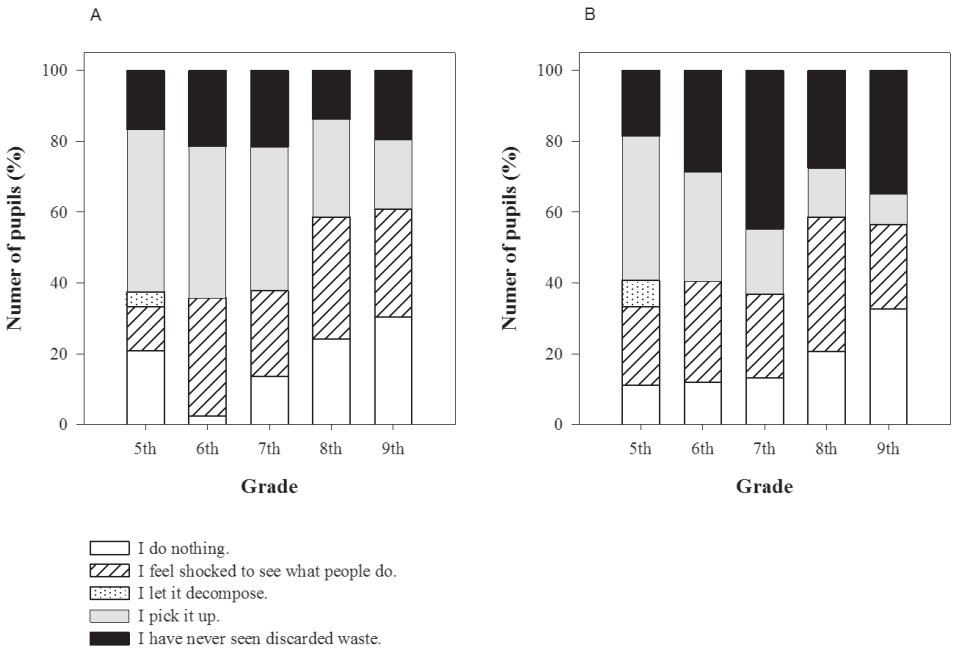

Figure 5: What do children do when they notice discarded car tyres (A) or spilt motor oil (B) outdoors?
Slika 5: Kako ravnajo učenci, ko opazijo zavržene avtomobilske gume (A) ali razlito motorno olje (B) na prostem?

not separate waste by fractions and do not compost organic waste, children are very unlikely to do this themselves. Although pupils learn in the 6th grade which waste can be composted, they cannot apply this knowledge in their everyday life if there is no support from their parents.

Results also revealed that certain hazardous waste is also treated improperly. Lacquer and varnish tins and detergent bottles are often not perceived and treated as hazardous waste, and disposed of accordingly. They often end up either in the mixed-waste container or in a bin for waste fractions (Tab. 2). Results about the disposal of antibiotics are also rather discouraging, since 26% pupils replied that they put antibiotics in a bin for mixed waste (Tab. 2). Furthermore, children treat vegetable oil as nonhazardous waste, and for this reason it is frequently discarded in mixed-waste containers or poured down the drain. Few pupils reported that they take used vegetable oil to a waste collection centre (Tab. 2), even though this would be the proper thing to do.

Data also shows that pupils dispose of used motor oil and batteries as recommended.

The share of pupils who do not know how to treat certain waste is not insignificant. The reasons for this could be found in a lack of attention to waste management and environmental protection topics within the science and biology curriculum, particularly in the third cycle of the primary school (pupils aged 12–15). Kellert (1985) suggests that the most appropriate age to foster environmental concern and action in students is 13 years. According to our educational system these are pupils of third cycle. Gopurn (2010) also notes that environmental topics in this cycle are discussed in terms of individual subjects, such as biology, and not interdisciplinary. The same author finds that Slovenian pupils possess very limited and occasionally too specific knowledge about environmental issues.

If pupils learned about waste management in the upper grades of compulsory education they would perhaps be more likely to manage

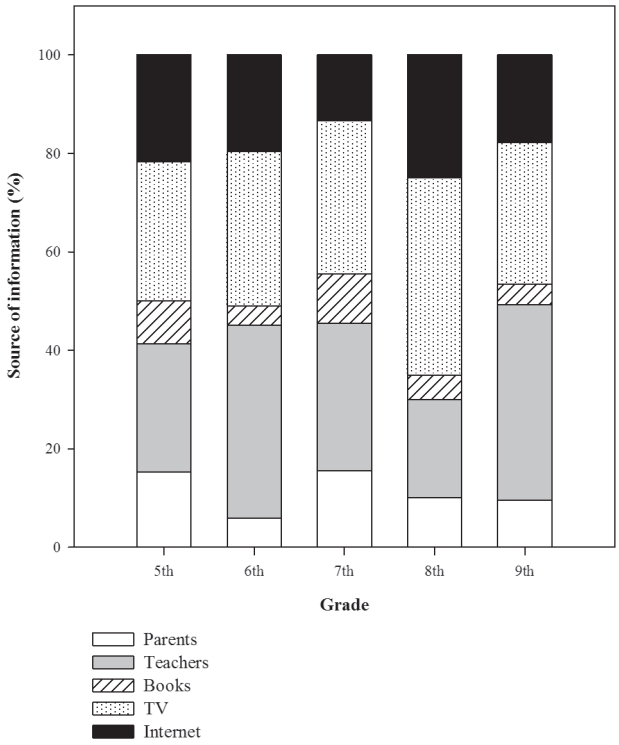

Figure 6: The pupils' source of environmental information.
Slika 6: Viri informacij o vplivih nevarnih odpadkov na okolje.

waste properly. Different authors point out that schools are an important source of environmental information for pupils (Chan 1998, Rickinson 2001, Kobierska et al. 2007, Shepardson 2007). Lester et al. (2006) provide evidence that students who possess some knowledge of science have greater environmental awareness than those whose knowledge of science topics is poorer, and can even influence their parents to adopt pro-environmental behaviour (Leeming et al. 1997). This is important, particularly since we found that the children rarely mentioned their parents as a significant source of information about the impact of hazardous waste on the environment (Fig. 6). From what our results tell us we can speculate that parents also lack sound knowledge about this topic. This is evident in Tab. 2, which shows that proper waste management at home is definitely not an exclusive domain of pupils.

We find that children get most of the information about the impact of hazardous waste on the environment from the TV, and the internet (Fig. 6). These results are supported by the study by Yurttaş and Sülün (2010) and Kobierska et al. (2007). If there were more TV programmes about environmental topics for parents and pupils this would improve the environmental awareness and foster the sensitivity of the public (Yurttaş and Sülün 2010). Children and their parents may thus be willing to take a step toward reducing their "waste footprint".

It should be noted that solely the knowledge that the pupils have does not necessarily promote pro-environmental behaviour. The latter can be supported by the study of Kuhlemeier et al. (1999). Also, Kobierska et al. (2007) demonstrates in a study that good environmental knowledge is not always accompanied by pro-environmental behav-

iour. We saw in this study that pupils could correctly rated waste as hazardous or non-hazardous. However, when we asked them what they do when they see discarded waste in the streets or in the nature we found that pupils from the last cycle mostly do nothing or merely feel disgusted at the actions of others. Pupils from the second cycle frequently reported that they pick up such waste themselves or notify a waste collection company or a waste treatment centre (Figs. 3–5). We could speculate that pupils from the second cycle, at least to some extent, provided the answers that they thought we expected from them. Leeming et al. (1997), however, notably found that younger pupils show significantly more positive attitudes toward the environment than their colleagues from upper grades, which goes against our speculation. As in the study of Zelezny et al. (2000) also girls in this study expressed greater proenvironmental attitudes than boys did.

Kellert (1996) finds that pupils aged 12–15, are the most receptive to learn about environmental issues. They should therefore be engaged in a learning process through which they would improve their knowledge about waste management, and become more willing to take pro-environmental action. A belief that waste and other environmental issues pose a significant problem to society and the self can change intentions toward acting (Barr 2007).

In order to facilitate a change in pupils' behaviour and raise their environmental awareness, we propose that environmental education should be an integral part of the curriculum throughout all three cycles of compulsory education.

Conclusion and Implications

To our knowledge, there exists little or no information about how primary school pupils perceive waste hazardousness and its impact on the environment. This study showed that the knowledge children have about waste management is not necessarily reflected in their actions, as we had expected.

If pupils are to improve their behaviour and environmental awareness, they need continuity in environmental education, which should be provided by the school and at home.

We propose that topics concerning environmental issues be added to the current biology and science curricula. Our findings show that although pupils can correctly identify hazardous waste, they still do not behave environmentally responsibly. We therefore believe that pupils need to be engaged in activities that would help them to improve knowledge on the matter and develop positive attitudes toward the environment. The latter is, however, subject to further research.

Povzetek

Vsebine o okoljskih problemih (npr. ravnanje z odpadki in drugo) so skopo zastopane v učnih načrtih s področja naravoslovja. Vsebine so sicer vključene v različne učne načrte prve in druge triade, vendar so v tretji triadi obravnavane zelo ozko, skopo in ne interdisciplinarno (Gopurn 2010). Učenci tretje triade naj bi bili zelo dovzetni za učenje o okoljskih problemih (Kellert, 1985), kar je bilo očitno pri snovanju učnih načrtov v Sloveniji spregledano.

V raziskavi nas je zanimalo, katere odpadke učenci ocenjujejo kot (ne)nevarne, ali sledijo priporočilom ravnanja z (ne)nevarnimi odpadki doma, kaj naredijo, če naletijo na odpadek zunaj (v naravi) in kje dobijo največ informacij o nevarnosti odpadkov.

Ugotovili smo, da so učenci večino odpadkov pravilno ocenili kot nenevarne (olupki sadja, stelja, razpadajoč les) in nevarne (pločevinke, plastične vrečke, poškodovane plastenke detergentov, antibiotiki, baterije in motorno olje) za okolje in organizme (Slika 1). Učenci petih razredov so ovrednotili olupke sadja kot bolj nevarne v primerjavi z ostalimi učenci. Učenci šestih in sedmih razredov so ovrednotili baterije kot manj nevarne v primerjavi z ostalimi učenci. Devetošolci pa so ovrednotili antibiotike kot manj nevarne v primerjavi z ostalimi učenci. Razlike so bile statistično pomembne. Dekleta so običajno odpadkom pripisale višjo nevarnost kot fantje (Tab. 1).

Pri ravnanju z odpadki doma smo ugotovili, da učenci nekatere odpadke raje kot ločujejo vržejo v zabojnik za mešane odpadke (Tab. 2). Rastlinsko olje zavržejo tako, da ga zlijejo v odtok, antibiotike in pločevinke agresivnih čistil pa pogosto vržejo

med mešane odpadke. Učenci so navajali, da za motorno olje in baterije poskrbijo tako, da odpadek odpeljejo ali v zbirni center ali pa oddajo, ko poteka akcija zbiranja nevarnih odpadkov.

Pri završenih odpadkih pa se je izkazalo, da so učenci druge triade bolj pripravljeni delovati v smislu odstranjevanja odpadkov iz okolja kot njihovi vrstniki iz tretje triade (Slike 2–4).

Ugotovili smo tudi, da starši svoje znanje o vplivih nevarnih odpadkov na okolje le malokrat posredujejo otrokom. Za učence so tako pomembni viri informacij o tej temi splet, oddaje na televiziji in učitelji v šoli (Slika 6).

Rezultati raziskave nakazujejo, da bi morali biti učenci vseh triad vključeni v učni proces, preko katerega bi lahko usvojili dodatna znanja o ravnanju z odpadki in bili (bolj) pripravljeni delovati pro-okoljsko. Prav učenci tretje triade so za učenje o okoljskih problemih najbolj dovzetni (Kellert 1985).

Za spreminjanje delovanja učencev, predlagamo, da se okoljske vsebine vključijo v izbrane učne načrte vseh triad.

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