CONNETION BETWEEN EDUCATION LEVEL AND SOURCE OF 3R KNOWLEDGE WITH THE PRACTICAL USE OF 3R PRINCIPLES

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Abstract

Modern economic and technological developments have long been recognised as drivers of intense impact on the future potential of our planet and its sustainability for the long term. In recent decades the scientists and a society as a whole have been trying to find a solution for minimizing the impact on the planet and the people. Some answers seem to emerge in recent developments of technology which enables transformation of the old ways and implementation of the new economic concepts such as social entrepreneurship, doughnut economy, circular economy, sharing economy etc. The practical implications are reflected in accepting the principles (the pillars) of sustainability known as the 3R: Reuse, Reduce and Recycle. Applying these in practice, leads to decrease in the usage of energy and resources thus lessening the impact on the environment. To achieve the results, the societies should take twofold actions, on the producers' side, as well as on the side of the consumers.

In this paper the author focuses on the consumers' side of the equation trying to identify what motivates the consumers to engage in responsible and sustainable consumption and could the education be the key factor that enables turning the "green" concepts into their everyday practice. The consumers play an extremely important role where the waste would go, thus giving the companies to recollect the items that can be used as a new input. On the other hand, the consumers, who apply responsible and green choices when buying products and services, can also convince the producers to shift towards more sustainable resources and ways of doing their business, due to the economic motivation.

After the literature review of the latest research in this area, the authors present a part of a larger research project which explores the Croatian consumers' awareness and their engagement in reducing the waste, reusing the items that still can be used and separating the waste before the disposal to make the recycling possible in their everyday life. This preliminary communication seeks the connection between the sources of knowledge about the circular economy and the 3R concepts and the consumers practicing such a behavior. On the other hand, it also tries to check if the education level can be the important channel to create more aware and responsible consumers that apply the 3R principles in practice.

Keywords: education, sustainability, social entrepreneurship, circular economy, reduce, reuse, recycle.

1 INTRODUCTION

Modern society has long been facing economic and technological development, which has become even faster in recent decades. New technologies and their impacts on society and the economy have long been recognised as drivers of intense impact on the future potential of our planet and its sustainability for the long term.

But the development doesn't come without the consequences and the cost, so the scientists and a society as

a whole have been trying to find a solution for minimizing the negative impact on the planet and the people. Contrary to nature and its circling processes, people are still primarily think and act in a linear way – "make, use, dispose" (Stahel, 2016). This is additionally reinforced by consumerism approach, where the prosperity of an economy could only be reached by perpetual growth induced by unbounded desires of consumers (Rojek, 2004). The recent developments of technology (industries 4.0, and emerging industry 5.0) enable transformation of the old ways and implementation of the new economic concepts such as social entrepreneurship, doughnut economy, circular economy, sharing economy etc. The right question is what companies can do to lessen their impact is to "move from 'do no harm' to 'do good'" (Zahra & Wright, 2016). The practical implications are reflected in accepting the principles (the pillars) of sustainability known as the 3R: Reuse, Reduce and Recycle. Applying these in practice, leads to decrease in the usage of energy and resources thus lessening the impact on the environment. To achieve the results, the societies should take twofold actions, on the producers' side, as well as on the market pull factor and the role of the consumers (Shen et al., 2013).

At the beginning of this paper the author presents the issues that jeopardize the sustainability of our planet and the society as a whole and the shift of the focus from the companies as the only factor that could offer a solution. We present newer developments of the ideas that determine the values for the companies and how they are intertwined with the values of the consumers. In this part presented are the concepts of the corporate social responsibility and social entrepreneurship which helps the rise of the more conscious consumers. The process is mutual so more and more aware companies and consumers pull more and more other companies and consumers into the swirl. Further we present the review of the recent research on the factors that influence the consumers' behavior into the 3R practices. Our special interest in this preliminary communication is on education as the influencing factor to consumers 3R practices in everyday life.

After that we present the part of the results of our research that was exploring the awareness on the of the 3R sustainability values of Northern Croatia consumers, and if they are motivated and engaged in 3R practices in their everyday life. The 3R practices will be observed as the dependent variable which is influenced by the education of the respondents and the sources from which they have learned about these circular economy and sustainability principles. This is important because Croatia needs to achieve of waste management objectives (Spasić, 2021; WB, 2021), where Croatia is still struggling and Northern Croatia is one of the economically advanced regions and can become a leader of the other regions in this process. The results could offer the tools for practitioners on how to easier motivate people into 3R practice in their actions.

2 SUSTAINABILITY AS AN ISSUE – WHAT COULD BE THE PATHS TO THE SOLUTIONS?

As we have previously shown, sustainability of the planet is endangered by the ways how people live, but lately many actors have started to show awareness and willingness to change these trends. As one of the answers we see the emergence of the social entrepreneurship. It links different stakeholders from public, private, and civil sector, which helps them to gather different needed resources as well as the political support. This interconntedness helps the social entrepreneurs to achieve their social goals, while in the same time pursuing of market opportunities fortifies their long term viability. (Helmsing, 2015) Miragaia et al. (2015) show how involvement in community actions through the sponsorship of the sport as part of their corporate social responsibility agenda can also encourage the company's entry into social entrepreneurship field. The gains for the company are reflected in improved reputation of the company which helps them to strengthen the loyalty and better inclusion of all the stakeholders and in the end, better sustainability because it creates jobs and seeks the innovative solutions to societal needs fulfilment.

2.1 Former Approaches to Empower Sustainability

Environmental protection has formerly been mostly connected with the top-down approach, whereas the companies were legally obligated to include environmental agenda into their deeds. But through the analysis of the WEF (World Economic Forum - the organization that researches the global competitiveness of the countries from 1979) documents, strategies and reports we can see the shift from this opposition of companies vs. public policies that have been endangering their profits towards the joint actions to develop the responsible green consumer. This way, all the sides could work together to mitigate the global warming effects. (Giesler & Veresiu, 2014) Even though, sustainability programs in companies have become a very important element of the efficiency and success, the consumers' habits still have to catch up. (Thoo et al., 2021)

2.2 Changing the Focus from Companies to the Sustainable Consumer Choices

In their work Giesler and Veresiu (2014) set the intervention strategies that would affect the consumers to be moral in their acting on the market whilst also free and economically rational. The responsible consumer subject is not inherent to the capitalist market, but it is necessary to the market development and stability. In order to be effective it requires morally acting individual consumers. They identify four intertwined processes that develop the responsible customer, so called P.A.C.T: Personalization (forming of moral stance towards desired behavior to solve a certain problem) authorization (finding arguments in science and expert opinions for such a stance); capabilization (finding tools); and transformation (adoption of new moral understanding).

Mass production and consumerist trends resulted in ecological, resource, health and safety problems, which asks for tackling from both sides, policies and environmental standards, as well as the new environmental awareness in consumers. Kianpuor et al. (2017) in their analysis of trends in electric and electronic equipment (EEE) industry noticed the processes of reverse supply chain management where the companies collect the used EEE products on the end of their life to be reused, recycled and/or refurbished. This process heavily relies on the willingness of consumers to engage. Junior (2017) stresses out that the process of transition from only knowing and speaking about the environmental sustainability to making it your sustainable practice is a very challenging one. It requires the changes in both production and consumption. Without involving the consumers, it will probably not become effective. He recognized the beliefs as the influential factor for developing sustainable behaviors, because they affect how people organize and perform their activities.

Syaekhoni et al. (2017) have investigated green purchase intentions which affect consumers decision-making behavior in a more socially responsible manner. This means that the consumers become aware of the consequences of their decisions on the overall well-being of the society. Systematic socially-aware behavior results in purchases that are able to start societal change while meeting their everyday needs. Based on literature review of multiple prior research Kianpuor et al. (2017) analyzed the linkage between eco-literacy (knowledge) and consumer's attitude towards recycling (based on value, awareness and assumed benefits).

At the moment we are witnessing the rise of the inclusive and sustainable consumers who have a real power. By the way they decide to spent their earnings, they show the companies what subjects they care about, what is important to them (Dua, 2022) The consumers of the generations Y&Z (born from 1980s on) prioritize sustainability, diversity, equity and inclusion so by their power of the purse they influence the companies on new ways of doing business. To get their attention, the companies have to be extremely careful on how they communicate their values. On the other side, Alan Murray writes about the companies who are getting aware of that, because we can see the shift towards putting the social purpose along with the focus on the goals (Narisetti, 2022) Even during the pandemics, the goals of the companies aligned more to these of the stakeholders' goals, so it is really important to have in mind the values of the ever more sustainability aware consumers.

The research today often focuses on different facets of the customers' sustainability actions which sometimes tackle only some parts of the 3R concept, such as reducing packaging (Granskog et al., 2020; Testa et al., 2020), reduction of e-waste and recycling (Islam et al., 2021; Pérez-Belis et al., 2017), reusing clothes (Cruz-Cárdenas et al., 2019) and similar topics. Social entrepreneurship in practice has large impact in certain fields, such as the clothing. Staicu (2019) has done an analysis which estimates that production of clothes has doubled in the last 15 years, and more than 50% of them are thrown away in less than a year. The most of this clothes might still be used for at least 2-3 years more. Thus, social entrepreneurship in the area of reused textiles could prevent excess textile waste. But the 3R practices usually rely on reasoning of particular people and their specific traits and attributes, attitudes, beliefs or expectations and experiences (Thungren & Zargari Zenouz, Nastaran, 2017) and this is the reason that it has to be investigated within the interdisciplinary research. Interesting findings are also presented in the work of Attiq et al (2021) who have investigated motivations for the 3R practice in food waste. After adding more appropriate theoretical foundations - the theory of interpersonal behavior (TIB) and the comprehensive model of environmental psychology (CMEP) - to usually used theory of planned behavior (TPB) they have managed to prove that emotions (primarily anticipated guilt) are the most important factor for predicting practice of 3R in dealing with food waste.

3 CONNETIONS OF EDUCATION WITH PRATICE OF 3R

Education has multiple role in practicing of 3R behaviour. Some research indicates that people with overall higher level of education tend to practice more of 3R principles in their everyday life, while the other show

that introducing 3R concepts through educational programs, especially from the younger age can have certain effect on 3R practices. Therefore, in this chapter we present the effects of both based on the literature review and grouped along the education levels.

3.1 Impact of Higher Education on Environmental Awareness and Consequentially on 3R in Practice

Higher education (HE) can make the students more accepting of environmental policy instruments which shows that there is a direct effect of HE on environmental policy support through the level of environmental norms and awareness how their behavior can have negative effects on the environment. (Harring et al., 2020) He has also shown in some previous research that economics students tend to be more prone toward market-based environmental policy measures (Harring & Jagers, 2018).

Thoo et al. (2021) also explore the linkage between recycling intentions and recycling behavior in HE (university setting) mostly with focus on plastics and energy as the parts of green initiatives. Their findings connect students' intentions of recycling behavior with influence of their friends, mates, media and environmental groups. Flannagan (Flanagan, 2017) has shown how educating middle school students can positively affect their waste separation and recycling practices because at that age they can start to consciously think about their habits and become more proactive in order to preserve natural resources or do not create unnecessary waste. This implies that there should be more courses that would introduce environmental topics into the curricula.

3.2 Lower Educational Levels and the 3R Practices

Altikolatsi et al. (2021) have shown that family attitudes and recycling behavior heavily affects the recycling behavior of the primary school students, and the education about environmental and recycling topics (in addition with posters, leaflets, comics, and animations) are important to create awareness and commitment to such a behavior. Interesting result was also that mothers and fathers of the recycling reported students had on average higher educational degree. It can be compared to the results of the Faridy and Rohendi (2021) who have found out that the parents' education plays an important role in children developing 3R behavior – the education the higher the education, the more practice of 3R in children's actions. They also found out that introducing the child with 3R practice early, creates habits in this kind of behavior and the parents themselves practicing 3R behavior themselves enables learning by example. Children who practice 3R are more aware of the environmental issues and sometimes prefer to reuse, but in some cases insufficient infrastructure for waste separation or the impression of the used-goods not being really clean prevents them from exercising 3R in their actions. This was also corroborated by the research of Chun T'ing et al. (2020) who have, among other factors, confirmed that habits positively affect 3R behavior, and the habits are usually developed in younger age when your school, guardians and teachers have an important role.

Newer efforts by Nadzir & Seowfuddin, (2019) also propose development of a mobile application for learning about 3R concepts and awareness of the need to care for the environment from the youngest age. Many people are familiar with the concept, but only a small proportion use them in practice so starting in young age could enhance their practicing of the sustainability principles. However, the developers identified the need for simpler words that can be understood by the youngest, and inclusion of more “gaming” elements into the application, such as descriptions, activities and animations. (Nadzir & Seowfuddin, 2019) The other researchers have also developed and tested Augmented Reality (AR) based tool where today omnipresent information and communication technology (ICT) would help elementary school students to easier learn about the 3R practices (Sulistyowati et al., 2021). Already mentioned work of Attiq et al. (2021) recommend that practitioners should use this notion in creating programs and advertising campaigns to better motivate consumers in reducing food waste and using the 3R principles in practice. They also propose to educate consumers about general environmental topics to raise awareness on their importance.

4 RESEARCH METHODOLOGY

The research objectives of this paper are twofold: a) to identify whether education level in northern Croatia region makes any difference in practicing 3R in everyday life; and b) does the source of information and/or knowledge about the circular economy and 3R principles make difference in 3R practices in their everyday life. This region was chosen due to the level of economic development, where these counties (Varazdin county, Medimurje county, Koprivnica-Krizevci county and Krapina-Zagorje county) have higher contribution of the manufacturing industry to the GDP compared to the rest of the country. The four northern Croatian counties make only 12.4% of total Croatian population, at the same time have a share of 24.2% in total

Croatian manufacturing industry and their total exports make 17.2% (CBS, 2021). This shows their economic strength and indicates that the population good basis for growing awareness of the researched 3R principles since people in more developed regions tend to be more ecologically aware.

4.1 The Questionnaire

The questionnaire has been developed in concordance with similar research done in other settings mentioned in the literature review (by the most part based on Pérez-Belis et al., 2017; Shen et al., 2013). The survey data were collected by survey composed in online google form tool which today widely spread manner to collect data by self-administered surveys. As Dillman (2007) suggests, the self-administrated questionnaire tend to minimize the risk of participants' positive answers towards the responses they believe are more socially acceptable. Since it targeted adult population, it was appropriate because many people started remote working during the COVID lockdowns so they are not as reluctant any more to engage in online activities. (Koeze & Popper, 2020). Based on Eurostat's data, in Croatia daily internet users rose from 58% to 78% share of population from 2017 until 2020, and due to the shift to remote work further i 20% (so reaching altogether cca 99% of adult population) use internet at least weekly and 85% of all households have internet access in 2020 (Statista, 2021a, 2021c, 2021b). This is why it is expected that the internet survey was a plausible tool to examine the research questions. The questionnaire was shared through personal email contacts who were asked to send it further (snowball convenience sampling) and was also shared and re-shared online on social networks (Facebook, LinkedIn and Forum.hr) in groups/topics for students and researchers who are collecting research participants.

It consists of 5 sections intended to collect data for a more elaborate analysis. The first section comprises general participant data. The second one is about their attitudes about altruism and ecological awareness which is seen as a prerequisite for a person to be willing to engage in sustainable and responsible activities. Three remaining sections were dedicated to 3R principles, namely Reuse, Reduce and Recycle and the last one is about the source of their information and knowledge about the circular economy and its principles; whether they first heard about it and later learned about it in school/university, was it form the friends, family or their social circle, or did it came only form media sources.

4.2 The Sample Descriptive Statistics

The respondents could have filled the questionnaire during the 14 days in the September 2021, and in this 2-weeks period 102 respondents completely filled the questionnaire. Women make 81% and men 19% of the sample. Mode age is in range 36-45 years (40% of the sample) with slight inclination towards younger side where 75% of the respondents are between 18 and 45. The distribution over the encompassed 4 counties is on the Varazdin county side which makes about 71% of the sample, Medimurje and Koprivnica-Krizevci counties make 11% and 13% respectively, while Krapina-Zagorje county here makes only about 5%. This is not in line with the geographical dispersion of the population, therefore we cannot straightforward generalize the results to the whole population. However, it offers useful insights into the topic and can serve as basis for fine tuning the proceeding research activities.

The majority of respondents are employed (84%) and 4% of them are self-employed, the others are still studying, are unemployed or retired, therefore not earning. 48% are paid above average Croatian salary, 13% receive average, and 30% less than average, the rest don't earn income or don't want to answer.

4.3 The Data Transformations

By the level of education, the respondents were divided into three groups, 1 indicated they have maximum finished secondary level of education, 2 that they have some college or post-secondary vocational education, and 3 that they have graduate or postgraduate studies. To be able to determine if the source of their knowledge about the circular economy and its concepts of 3R mattered in their 3R practices, we have also divided them into three groups where 1 indicating they have learned about it in school, 2 that they have learnt it from their societal circle (friends, family, social networks) and three that they have been familiarized with the concepts through different media channels (TV, web pages, newspapers etc.).

To be able to draw conclusions the data on environmental awareness 3R practices were transformed by calculating scores for each observed construct. In questions regarding certain claims connected with environmental awareness the respondents had to evaluate the claims on Likert's 1 to 5 scale where 1 indicated "I completely disagree" and 5 represented the claim "I completely agree". There were 6 claims and for each respondent were calculated scores for environmental awareness that could have reached minimum 6 for least agreeing with environmentally friendly claims to maximum of 30.

The scores for item Reuse were calculated based by adding the results on the answers for reusing (second-hand usage) of the clothes, shoes, electronic and electric equipment, dishes & cutlery items, furniture, glass packaging, plastic boxes with lid, paper bags, plastic bag, cardboard box and cars. The answers were coded accordingly: 1 for No, 2 for Only from the known persons (family/friends) and 3 for Yes. Possible scores range from minimum 11 to maximum 33.

The scores for item Reduce were calculated by adding the results on the answers for reducing the usage of energy and resources. These included: turning the lights out when no-one needs them, replacing the conventional and saving bulbs with the LED lights, closing the tap when washing teeth or taking the shower to save water, using reduced quantities of soap and detergents, not using single-use dishes& and cutlery, turning off high electricity users when leaving house, not printing of digital documents when not necessary, reducing packaging by bulk buying, reduce packaging by combining more grocery goods in one bag, using of multiple-use and washable bags. The answers ranged from 1 for never, 2 for rarely, 3 for sometimes, 4 for often and 5 for always. Possible scores range from minimum 10 to maximum 50.

The scores for item Recycle (at home/school) were calculated by adding the results on the answers for separating different forms of waste at home or at school. The waste separating covered recycling of paper, plastics, metal packaging, glass and glass packaging, bio-mass for energy production, bio-mass for composting, electronic and electrical equipment and batteries. The answers also ranged from 1 for never, 2 for rarely, 3 for sometimes, 4 for often and 5 for always. Possible scores range from minimum 8 to maximum 40.

The scores for item Recycle (at home) were calculated by adding the results on the answers for separating different forms of waste at home or at school. The waste separating covered recycling of paper, plastics, metal packaging, glass and glass packaging, bio-mass for energy production, electronic and electrical equipment and batteries. The answers also ranged from 1 for never, 2 for rarely, 3 for sometimes, 4 for often and 5 for always. Possible scores range from minimum 7 to maximum 35.

5 RESULTS

First we wanted to check how environmentally aware were our respondents and if the awareness depended on the level of education. The claims are presented in the table 1.

Table 1. Claims on the Environmental awareness

It is important to me that the products I use do not damage the environment.
I consider the potential impact of my actions on the environment when making many of my decisions.
My buying habits are influenced by my concerns about our environment.
I am worried about the loss of our planet's resources.
I would describe myself as an environmentally responsible person.
I am ready to accept the inconvenience to take actions that are more environmentally friendly.

Source: data from own research

Analysis of the environmental awareness scores shows that the level of education has no effect on the environmental awareness of the respondents, even though there is a little bit bigger dispersion of the awareness among the respondents with lowest level of education (shown in Table 2)

Table 2. Differences in Environmental awareness based on educational level

Awareness	**Score for Awareness**			
Level of education	**minimum**	**maximum**	**average**	**SD**
High school	8	30	23,12	5,34

Some college and post-secondary vocational education	16	30	23,36	4,97
Graduate and post-graduate studies	11	30	23,14	4,88

Source: data from own research

The most of our respondents (88%) have heard about the circular economy concept, but the source of the information and the knowledge about it and its principles are not important for the using of 3R in practice. The total score on 3R was calculated by summing up the scores for each practice (Reuse, Reduce and Recycle) which is shown in Table 3.

Table 3. Differences in Total 3R practices based on the source of information and knowledge

	Total Score			
Source	**minimum**	**maximum**	**average**	**SD**
School	116	168	147,07	14,58
FF&SN	90	170	151,78	18,56
Media	92	167	142,71	18,54

Source: data from own research

The results indicate that source of the information and knowledge about the circular economy and its concepts has no impact on the practicing 3R in everyday life. The average score even indicates that people who learned about it from their social circles show more everyday practices of 3R.

The next step was to see if there were any differences in practices of particular components of 3R in connection with the educational level of the respondents, which is shown by average scores associated with each dimension in Table 4.

Table 4. Differences in 3R practices based on the educational level

	3R Practices			
Level of education	**Reuse**	**Reduce**	**Recycle (H/S)**	**Recycle (W)**
High school	27,76	39,76	31,41	25,94
Some college and post-secondary vocational education	27,45	41,73	33,09	25,55
Graduate and post-graduate studies	25,19	41,99	34,53	27,37

Source: data from own research

The data show that respondents with highest educational level generally score higher on practicing in almost every element of the 3R, but in case of Reuse the case is opposite, and in Recycle (at work) the respondents with only high school education scored slightly better than the respondents with some post-secondary education. Since these make only smaller part of the sample, this results ask for additional investigation.

Apart from that and since the scales for each principle were not measuring the same number of actions, we performed additional analysis and turned the scores into percentage to see at which principles are the scores the highest. The resulting numbers are presented in the Table 5.

Table 5. Differences in 3R practices based on the educational level (percentages)

	3R Practices			
Level of education	**Reuse**	**Reduce**	**Recycle (H/S)**	**Recycle (W)**
High school	84,1%	79,5%	78,5%	74,1%
Some college and post-secondary vocational education	83,2%	83,5%	82,7%	73,0%
Graduate and post-graduate studies	76,3%	84,0%	86,3%	78,2%

Source: data from own research

The highest percentages are observable in Recycling in the group educated in HE (86%), but also the reusing is showing high level of practicing in groups with lower level of education. It might be connected with usually lower salaries in lower educated respondents which is why they are more prone to using second-hand goods, and not disposing of the goods that still have usable value. Another interesting point is that the level of recycling measured by separating waste is evidently lower in work compared to the home/school setting. This might mean that waste separation in business entities is still not supported by infrastructure (e.g. in Varazdin households usually have 4-5 bins for waste separation, while business organization have only 3). This means that even when they would want to recycle, the circumstances are not favourable and the infrastructure for waste collection represents a bottleneck for practicing more of a recycling in the work setting. Anyway, the results are not too dispersed and ask for additional analyses.

6 CONCLUSIONS

Even though by the literature review and the results of the past research indicated that education might be an influential factor for the environmental awareness and consequentially for practicing the 3R actions in everyday life, our data show something different. The level of education or the source of the respondent's knowledge about the circular economy and the 3R principles do not affect our respondents' 3R practices much differently. Certain differences do exist, but the results offer mixed evidence.

This study is just the first step in the organizing the collected data and calculating starting point based on the literature review, and it serves as the preliminary communication. It has some limitations that can be named as the small convenience sample and the second is using of only descriptive statistics without any hypotheses testing, which would be able to show if the noticed differences had any statistical significance. This study serves as a pilot for adjusting the measurement questionnaire and to collect a bigger and more representative sample in the next steps.

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