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Modernisation of Science: Textbook and Workbook Analysis in Relation to Teacher Attitudes toward Changes in the Croatian Curriculum

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ABSTRACT Educational reform tries to raise students'competencies on the higher thinking level by improving curriculum and experimental materials. The attitudes of teachers toward outcome level in curriculum and experimental material is key to their effective use in teaching science. This study aimed to compare outcome levels of questions for science in 1st grade experimental textbooks and workbooks (from 2018) with previous ones (from 2008, 2013). Furthermore, teachers from 39 experimental schools completed the online survey toward the modernisation of science. Although a major shift has been noted in experimental materials (levels: analysis and synthesis), there is an urgent need for the decrease of lower thinking level questions (levels: knowledge and understanding). The online survey indicates a high positive attitude toward the experimental science curriculum (3.69) and outcome levels in textbooks (3.43) and workbooks (3.69). Further improvement of the science materials is prerequisite for curriculum reform and high-quality textbooks.

INTRODUCTION

Fast and large global changes at all levels determine the educational system, and hence the organisation of teaching and learning (Borić and Škugor 2011). Many studies show that the quality of science education for developing students' competencies required for the new problems brought by the 21st century lies in educational reform (Aldahmash et al. 2016; Grossman et al. 2007; Obaydullah et al. 2020; Roblin et al. 2018; Yaz and Kurnaz 2020). The structure of a student's competencies starts with managing and aligning learning outcomes at a certain level, which can track the students' progress. Learning outcomes define what is expected of a student to know, understand and be able to produce after a completion of the learning process (European Commission 2009). The European Union has proposed an education shift to focus on a clear set of observable and measurable learning outcomes. Obaydullah et al. (2020) stated that outcome based science education has many benefits for students reeling in their own learning and full understanding of the material. Furthermore, school and academic teachers, educationalists involved in outcome based education, and curriculum developers are key elements in managing outcome-based education.

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Literature Review

Students require relevant knowledge, the development of critical thinking and evaluation of information, but also the scientific way of thinking in science (MSE 2018). How can they achieve these goals? Textbooks and workbooks are the most frequently used learning support for science material. The availability of high-quality science textbooks and workbooks is a critical factor in the successful implementation of the scientific competences (Bölsterli 2015). Therefore, a textbook and workbook should not overpower the contents knowledge, but represent a collection of content geared to satisfy a wide range of students' abilities in the cognitive, affective and psychological areas. To make students understand scientific knowledge, they must first memorise information, understand, analyse, evaluate and create the data (Yaz and Kurnaz 2020).

Textbooks and workbooks have a vital role in curriculum reform, and are considered as most important tool for the implementation of a new curriculum in many countries (Abdel-Hameed et al. 2014; Bölsterli 2015). For this reason, various researchers look at the role of questions and activities when analysing the science textbook and workbook. Questioning and experimental activities are an integral part of a meaningful learning and scientific inquiry (Aldahmash et al. 2016; Chin and Osborne 2008).The formulation of a good question is a creative act, and at the heart of doing, is what science is all about. Questions to students play an important role in the learning process, as they are a potential resource for both teaching and learning science. Given that asking questions is fundamental to science and scientific inquiry, the development of students' abilities to solve the problems and to think critically should become a central focus of the science education reform (Aldahmash et al. 2016; DeBoer 2011; Kahveci 2010; Zoller and Tsaparlis 1997). Chin and Osborne (2008) stated that questions in textbooks and workbooks have the potential to (a) direct students' learning and drive knowledge construction, (b) foster discussion and debate, thereby enhancing the quality of discourse and classroom talk, (c) help students to self-evaluate and monitor their understanding, and (d) increase students motivation and interest in a topic by arousing their epistemic curiosity. In teaching science, questions can help diagnose the students' understanding in a formative assessment, stimulate further inquiry into the topic via problem-based learning and project work, and provoke critical reflection on classroom practice (Borić and Škugor 2011; Borić and Škugor 2015). Howe et al. (2019) affirmed that questions in teacher-student dialogs were positively associated to student outcome levels, which jointly covered curriculum mastery, reasoning, and educationally relevant attitudes outcome. Every teacher needs to incorporate hierarchy of thinking levels, focusing on the inclusion of higher-order thinking in lessons, units of instruction, and even national curricula (Anderson and Krathwohl 2001). According to the arguments above, teachers with quality teaching materials, strategies and methodological approaches are the crucial agents of educational change. Garm and Karlsen (2004) analysed the teacher education after the new reform and compared their case study with European and world context. The authors observed that teacher education was focused on learning outcomes and external control became more dominant. Aldahmash et al. (2020) stated that teachers improve the learning outcomes of their students by developing their professional background, skills, learning preferences and encouraging a student's motivation. Therefore, many countries were making efforts to set higher standards in science assessments by increasing student learning outcomes (DeBoer 2011).

The increase of student learning outcomes may come from better connection of education theory and practice through the Research Practice Partnerships (RPP) between researchers and practitioners (people from practice, that is, teachers/professors) (Coburn and Penuel 2016). This represents a wide range of agreements between scientists and teachers, who consult each other, communicate, test, and try to improve schoolwork. Moreover, assessing the curriculum and textbook and workbook quality comprises the use of learners, teachers and experts' opinions about their attitudes (Roehrig et al. 2007). These opinions can range from teachers who have used the textbook to respondents who have only looked at the textbook in isolation. Some opinions of teachers who have used the textbooks are based on a thorough examination, specified on cognitive level thinking activities. Usually, teachers base their opinion on curriculum changes and on specified and formulated criteria, which they evaluate during the reform (Grossman et al. 2007). In most cases, the changes were positive, that is to say, it is necessary to learn from the experiences of others, and partnerships are expected to contribute to improving learning. The research considers RPP's basis for future advancement in the school system, which can be also proposal in the Croatian curriculum reform plan.

In the school year 2018-2019, the pilot phase of the curricular reform was carried on in the Republic of Croatia. The experimental programme "School for Life" (Škola za život) was implemented in 74 schools selected for participation, out of which 48 were elementary schools and 26 were high schools. The experimental programme is implemented in the first and fifth grade in all subjects, while in the seventh grade only the following subjects are included, namely, Biology, Chem-

istry and Physics. The aim of the experimental programme is to verify the applicability of new curricula, new teaching methods and to improve textbooks and workbooks in order to increase both students' competence and their satisfaction with education and teachers' motivation. It is the basis for enabling the development of key competencies essential in the process of realisation of one's personal potential, the continuation of education and lifelong learning.

Previous textbooks and workbooks from 2008 were written in accordance to Educational Plan and Program (MSES 2006), from 2013 were written in accordance to National Curriculum Framework (MSE 2011) and from 2018 were written in accordance to experimental National Curriculum (MSE 2018). Teachers on all educational levels need to review the experimental textbooks and workbooks during 2019 and give their critical opinions to improve experimental materials.

Relatively few studies of science textbooks and workbooks at the elementary school level have been conducted by examination of outcome level. None of these studies specifically examined curricula materials that were derived upon curricular reform. This study was designed to address that need.

Objectives of the Study

This study aimed at fulfilling the following objectives:

1. To examine the textbook and workbook activities and questions, which should be conceptualised in an equal quantity of outcomes level.
2. To explore elementary school teacher's attitudes on modernisation and advancement of science based on the Curricular Reform in Croatia.

Purpose of the Study

According to the objectives of the study, the researchers tried:

1. To investigate whether the questions and activities in science experimental textbooks (from 2018) allow more equitable acquisition of competences for the 1st grade students when compared to the previous (from 2008, 2013),
3. To investigate whether the questions and activities in science experimental workbooks (from 2018) allow more equitable acquisition of competences for the 1st grade students when compared to the previous (from 2008, 2013).
4. To explore teachers' attitudes about the science experimental curriculum and their perceptions of questions and activities in science experimental textbooks and workbooks in supporting the higher thinking student's level of competences.

METHODOLOGY

Textbook and Workbook Analyses

The research sample consisted of a first cycle elementary school's (first grade) textbooks "Our world 1" (De Zan et al. 2007; De Zan et al. 2013; De Zan et al. 2018) and a corresponding workbook "Our world 1" (De Zan et al. 2007; De Zan et al. 2013; De Zan et al. 2018), which were prescribed by the Ministry of Science, Education and Sport for the school years 2007-2008 and 2012-2013, and the experimental textbook and the associated experimental workbook, which are the result of an experimental curriculum for the school year 2018-2019.

The analysis of all practical activities included the in-chapter and end-of-chapter questions and practical activities, which could be divided into three types, that is, motivation activities at the beginning of each unit, questions and activities for exercise and repetition, and activities and experiments at the end of the unit. However, questions, practical activities and experiments in workbooks were presented as "questions". All activities were classified using the recommended verbs in shaping learning outcomes (http://www.kvalifikacije.hr/hr/dokumenti-publikacije), MSES (2013) based on European Qualifications Framework, European Qualifications Framework for Lifelong Learning, National Qualifications Framework, European Credit System for Vocational Education and Training, and adopted from Borić and Škugor (2011) study as follows:

- Knowledge: List the living beings (to remember)
- Understanding: Describe the habitat conditions for the plant growth (to estimate)

- Application: Illustrate the water cycle in nature (to apply)
- Analysis: Compare the fir and spruce (to distinguish)
- Evaluation: Value the technology used to record and predict weather (to judge)
- Synthesis: Create the healthy product from vegetables (to design)

The reason for using learning outcome-based analysis in Croatian textbooks and workbooks is that through the last two decades the Croatian educational system tried to develop the Croatian Qualifications Framework, a reform instrument for regulating the system of qualifications according to all European documents.

Data Collection on Teacher's Attitudes

Elementary school teachers' attitudes on science curriculum, textbook and workbook were collected using the online survey made for this research at the end of the school year 2018-2019. The initial contact was sending an online survey to 48 elementary schools in Croatia, which were involved in the experimental implementation of the "School for Life" curriculum. As many as 39 of them agreed to take part in the study. This sample was given an internet-based survey instrument with eight items including Likert-type scaled response from 1 being "I totally disagree" to 5 being "I completely agree". According to Aldahmash et al. (2020), results of the category were ranked as follows, that is, very high = 5-4.2, high = <4.2-3.40, medium = <3.40-2.60, low = <2.60-1.80, and very low = <1.80-1.

The online survey was designed to develop an understanding of how the teachers viewed new materials, as well as what underlying beliefs influenced their curricular implementation. The eight items were:

- I1: I generally notice the changes in the experimental curriculum in relation to previous documents.
- I2: I think the changes are positive.
- I3: I have noticed changes in science textbooks and workbooks when compared to the previous ones.
- I4: Questions in experimental science textbooks appear to have a higher level of Bloom's taxonomy compared to the previous ones.
- I5: Questions in experimental science workbooks appear to have a higher level of Bloom's taxonomy compared to the previous ones.
- I6: I believe that the experimental curriculum of science embraces more levels of Bloom's taxonomy.
- I7: I believe that the usage of science experimental textbooks and workbooks is better than the previous ones.
- I8: Students respond more positively to experimental textbooks and workbooks from science than to the previous ones.

Data Analysis

The statistical processing of all data was done in the programme Statistica 9.0. The levels of knowledge in textbooks and workbooks were compared by one-way ANOVA analysis, and if the level of variance calculated with the Leaven test was > 0.05, the *post-hoch* HSD Tuckey test was calculated. The level of significance used as statically relevant was $p < 0.05$.

The Chi-square (χ^2 test) was used to compare results in each item. The level of significance used as statically relevant was $p < 0.05$.

RESULTS

Two research questions were given. The first one addressed the questions comparison of science experimental textbook and workbooks (from 2018) for the 1st grade student's with the previous (from 2008, 2013), and the second question examined the teachers' attitudes about the science experimental curriculum and their perceptions of questions in science experimental materials in supporting the higher thinking level.

Question I: Do the questions and activities in science experimental textbooks and workbooks (from 2018) allow more equitable acquisition of competences for the 1st grade students when compared to the previous (from 2008, 2013)?

Table 1 summarises the number of questions in the science textbooks by outcome level. Overall, the number of questions in the textbooks increases from 2007 to 2013, reaching the doubled number in 2018. The results validate the main difference of all three textbooks according to the level of outcomes (ANOVA, $p<0.05$, Table 2), while

Table 1: Analysis of questions in 2007, 2013 and 2018 textbooks

Year	*2007*		*2013*		*2018*	
Outcomes	*N*	*%*	*N*	*%*	*N*	*%*
Knowledge	98	64.47	87	52.73	180	48.39
Understanding	47	30.92	43	26.06	81	21.77
Applications	0	0	0	0	21	5.65
Analysis	5	3.29	15	9.09	47	12.63
Evaluation	5	1.32	10	6.06	12	3.23
Synthesis	0	0	10	6.06	31	8.33
Total	152	100	165	100	372	100

Table 2: Factorial (ANOVA) analysis of the effect in the textbooks according to the level of outcomes, the year of publication (2007, 2013, 2018) and type of questions (motivation, repetition and knowledge testing, and self-research)

Effect	*SS*	*df*	*MS*	*F*
Outcomes	10059.20	5	2011.84	6.06*
Year	1692.93	2	846.46	1.77
Question types	1116.20	2	558.10	1.14

*$p<0.001$

years and type of group activities have not statistically affected the quality of textbook. The analysis showed the prevalence of knowledge activities in all three investigated textbooks (Tukey HSD test, $p<0.05$).

The outcome analysis in the activities and questions in science textbooks and workbooks was done comparing the date based on the evaluation by the students from teacher study and professors of subject matter. Taking into consideration the Bloom's taxonomy outcome level, the results confirmed that all activities, assignments in experiments and questions could be aligned as questions. Questions at the beginning of each unit (motivation activities, Table 3) and questions and activities for exercise and repetition (Table 4) were present in all three examined textbooks, while questions (activities and experiments) at the end

Table 3: Analysis of motivation activities at the beginning of each unit in 2007, 2013 and 2018 textbooks

Year	*2007*		*2013*		*2018*	
Outcomes	*N*	*%*	*N*	*%*	*N*	*%*
Knowledge	44	75.86	35	85.37	129	70.49
Understanding	14	24.14	6	14.63	39	21.31
Applications	0	0	0	0	1	0.55
Analysis	0	0	0	0	2	1.09
Evaluation	0	0	0	0	4	2.19
Synthesis	0	0	0	0	8	4.37
Total	58	100	41	100	183	100

Table 4: Analysis of questions and activities for exercise and repetitionin 2007, 2013 and 2018 textbooks

Year	*2007*		*2013*		*2018*	
Outcomes	*N*	*%*	*N*	*%*	*N*	*%*
Knowledge	54	57.45	49	58.33	50	37.04
Understanding	33	35.11	26	30.95	36	26.67
Applications	0	0	0	0	10	7.41
Analysis	5	5.32	7	8.33	14	10.37
Evaluation	2	2.13	0	0	6	4.44
Synthesis	0	0	2	2.38	19	14.07
Total	94	100	84	100	135	100

of the unit (Table 5) were present in textbooks from 2013 and the experimental textbook from 2018. Table 3 shows that the 2007 and 2013 textbooks had one or two motivation activities or questions at the beginning of each unit categorised at the lowest outcome level (knowledge and understanding), while other levels (application, analysis, synthesis and evaluation) were not present at all. In the experimental textbook (2018), levels of outcomes were as follows, with knowledge (70.49%), which was the most represented, followed by understanding (21.31%), evaluation (4.37%), synthesis (2.19%) and analysis (1.09%). In response to the research question, there were not as many higher level questions as should be present in from the curriculum material (experimental textbook 2018). In each textbook, there were up to three exercise and repetition activities (Table 4). In textbooks from 2007 and 2013, the largest number of activities was at the lowest level outcomes (first knowledge, then understanding), but missing two higher-level outcomes-based activities. Experimental textbook encompassed all levels of outcomes-based activities, and mostly knowledge (37.04%), followed by understanding (26.67%), evaluation (14.07%), analysis (10.37%), application (7.41%), and synthesis (4.44%). In particular, there were a much higher number of questions on higher thinking level suggesting a good structure and format written in accordance to curriculum suggestions, with an exception of questions in synthesis. Table 5 shows that the 2013 textbook contained one question at the end of the unit, while the experimental textbook had four questions in this category. The greatest improvement was seen in experimental textbook at the level of analysis (57.41%), followed by application (18.52%), understanding (11.11%), evaluation (7.41%), synthesis (3.70%) and knowledge (1.85%) in which the outcome "to research" was present as a name for that group of activities. The result implies that only question at the end of the units is suitable as curriculum material and based on the student centred activities that are oriented on higher order thing level outcome.

Table 5: Analysis of activities and experiments in the end-of-unit questions in 2013 and 2018 textbooks

Year	*2013*		*2018*	
Outcomes	*N*	*%*	*N*	*%*
Knowledge	3	7.5	1	1.85
Understanding	11	27.5	6	11.11
Applications	0	0	10	18.52
Analysis	8	20	31	57.41
Evaluation	10	25	2	3.7
Synthesis	8	20	4	7.41
Total	3	7.5	54	100

Table 6 gathers all activities in workbooks in which can be noticed a growing number of questions from the 2007 to 2018 workbook, however without significant difference (Table 7).

Table 7: Factorial (ANOVA) analysis of the effect in the workbooks according to the level of outcomes and the year of publication (2007, 2013, 2018)

Effect	*SS*	*df*	*MS*	*F*
Outcomes	5298.66	5	1059.73	13.68*
Year	500.33	2	250.16	0.65

*$p<0.001$

As opposed to that, one can notice the statistically significant increase between all three workbooks by observing the level of outcomes (ANOVA, $p<0.05$, Table 7). Workbooks from 2007 and 2013 contained the highest number of question

Table 6: Analysis of questions in 2007, 2013 and 2018 workbooks

Year	*2007*		*2013*		*2018*	
Outcomes	*N*	*%*	*N*	*%*	*N*	*%*
Knowledge	53	53.54	62	54.87	61	35.47
Understanding	6	6.06	18	15.93	30	17.44
Applications	21	21.21	14	12.39	18	10.47
Analysis	16	16.16	9	7.96	24	13.95
Evaluation	3	3.03	7	6.9	13	7.56
Synthesis	0	0	3	2.66	26	15.12
Total	99	100	113	100	172	100

in level knowledge, followed by application, while most of the assignments refer to "illustrate". At the level of analysis, most questions require students "to investigate". The experimental textbook contained mostly two outcomes levels knowledge (35.47%) and understanding (17.44%), followed by evaluation (15.12%), analysis (13.95%), application (10.47%) and synthesis (7.56%). The increasing of outcome level questions in workbooks is highly acceptable considering that during the curriculum reform, students should follow proposed standards and new competencies gradually.

Question II: What are the attitudes of teachers toward modernisation of science curriculum and activities in science experimental materials (from 2018)?

As many as 39 teachers from geographically dispersed schools in Croatia responded to the online survey. Looking at the attitudes toward modernisation all eight items were highly positive (Table 8). In general, most of the teachers observed the changes in the experimental curriculum (2018) when compared to the previous ones. Teachers considered the changes in the science experimental curriculum highly positive ($\chi^2 = 27.73$, df = 9, p = 0.001) and rated Item 2 as highest (4.00). Teachers noticed changes in science textbooks and workbooks ($\chi^2 = 24.76$, df = 12, p = 0.015) when compared to previous ones. Moreover, teachers considered that questions in experimental textbooks ($\chi^2 = 24.88$, df = 12, p = 0.015) and workbooks (χ^2=14, 30, df = 12, p = 0.028) appear at higher levels of Bloom's taxonomy compared to the previous ones. While a large number of teachers agreed that the experimental curriculum included more levels of learning outcomes (χ^2 = 15.73, df = 12, p = 0.020), they did not use the experimental textbooks and workbooks more than the previous ones ($\chi^2 = 22.49$, df = 12, p = 0.003), reflecting that teachers are not so delightful with the modernisation of curriculum materials. Despite ranking Item 8 the highest ($\chi^2 = 21.80$, df = 12, p = 0.039), which states that "students react positively to experimental textbooks and workbooks", this item was rated at the lowest level (3.56), which might indicate that the teachers recognise the need for the revision of curriculum materials with the aim of improving student competencies.

DISCUSSION

As this research is based on the comparisons of previous prescribed textbooks and workbooks with the new experimental program "School for Life" in the Republic of Croatia, one can state that this is a study, which can be part of the curriculum reform that initially began in the school year 2018-2019.

The Potential of Experimental Textbooks and Workbooks

The results indicated that the outcome level in questions and activities have been increased in experimental textbooks and related workbooks when compared to previous to a very light extent. There is a noticeable progress in the experimental textbook where the percentage of application, synthesis and evaluation activities was increased, which might indicate that experimental textbook is in accordance to the goal of curricular reform.

Table 8: Data (numbers, N; percentages, %; Cronbach α; mean, M and standard deviation, SD) about the online survey with eight items (I1-I8) that teachers (N=39) answered from 1 – completely disagree to 5 – completely agree

I	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*α*	*M*	*SD*
	1		*2*		*3*		*4*		*5*				
I 1	0	0.00	5	12.82	10	25.64	16	41.03	8	20.51	0.93	3.69	0.95
I 2	0	0.00	2	5.13	9	23.08	15	38.46	13	33.33	0.93	4.00	0.88
I 3	1	2.56	5	12.82	9	23.08	15	38.46	9	23.08	0.92	3.66	1.05
I 4	3	7.69	4	10.26	12	30.77	12	30.77	8	20.51	0.91	3.46	1.16
I 5	2	5.13	6	15.38	10	25.64	15	38.46	6	15.38	0.92	3.43	1.09
I 6	1	2.56	3	7.69	9	23.08	20	51.28	6	15.38	0.92	3.69	0.92
I 7	2	5.13	9	23.08	8	20.51	10	25.64	10	25.64	0.92	3.43	1.25
I 8	2	5.13	3	7.69	17	43.59	5	12.82	12	30.77	0.92	3.56	1.16
Total				39	100						0.93	3.69	0.95

Many studies confirmed that improvement of outcome level in science textbooks and workbooks area central focus of the science education reform (Abdel-Hameed et al. 2014; Aldahmash et al. 2016). However, when comparing the activities and questions in science textbooks through all outcome levels, the domain knowledge is still the most prevalent. Obaydullah et al. (2020) suggested that primary science material should focus on competency building and skill orientation rather than only theoretical knowledge. Cycle-1 elementary science textbooks for analysis, according to Abdel-Hameed et al. (2014) showed that knowledge and understanding questions predominate (40-45%), which equal to sixty to ninety percent in this study. Analysis questions came second (35-40%), which was eight percent in this study, and synthesis and evaluation came last (up to 15%), which was twelve percent in this study. The researchers found that about a quarter of the questions belong to higher-order thinking questions. This is in accordance to previous studies of science textbooks and workbooks before curriculum reform (Borić and Škugor 2011; Borić and Škugor 2015). Boriæ and Škugor (2011, 2015) also confirmed that the largest number of questions lie in the lower outcome level, which does not enable the acquisition of student competence to a sufficient extent. It can also be said here that the results obtained by Borić and Škugor (2011, 2015), and in the study likewise, are not in line with the requirements of the National Framework Curriculum (MSE 2011) and the Croatian Qualifications Framework (MSE 2018), since the issues analysed do not contain higher levels and do not encourage enough competences such as synthesis and evaluation. In other words, textbooks and workbooks do not often encourage students to explore or think about the phenomenon or gather information as were proposed by Chiappetta and Fillman (2007), although setting scientific questions and solving the problem is key to activities at higher levels of outcomes. The researchers can also conclude that the activities and assessments of textbooks do not encourage students to ask "why and how". However, results from science experimental workbook showed that thirty-five percent of the questions belong to higher-order thinking questions, which indicates that the newly developed workbooks are consistent with the curriculum reform expectations in the Republic of Croatia to a certain extent. Obaydullah et al. (2020) gave the model of outcome based educational reform of primary science emphasising the setting of clear standards for observable and measurable outcomes. The model takes into account the input as enablers, infrastructure, and well-structured curriculum as procedures, methods and outcome as results of skilled student. Croatia started this processes in order to direct policies, activities, projects and the technology implementation area in schools by 2030, ensuring long-term sustainability and impact of initial investments. The first stage of the comprehensive curricular reform in the Republic of Croatia, devoted to the development of curricular documents, was completed in February 2016. In 2017, Ministry of Science and Education started the STEM project aimed at development of STEM skills in students. Based on educational developments in Europe, in the world and in Croatian educational tradition and documents in 2018 proposed curriculum document for primary education have been completed and published. Therefore, one can see that these regulations establish methods of involvement, the manner and the content of documents supporting the curricular reform from 2018-2019. The further step that needs to be planned is to involve students as learners and active participants learning from curriculum materials (Obaydullah et al. 2020). There are differences of opinion concerning what are the most appropriate ways to describe level of outcomes in science textbooks and workbook and what the balance should be (Abdel-Hameed et al. 2014; Aldahmash et al. 2016, Bölsterli 2015; Kahveci 2010). However, if well written, questions and activities can have a clarity about them that can effectively guide instruction and assessment. Education competency models may be more difficult to describe and assess but are more effective for what the researchers hope the result of education will be. To be effective, DeBoer (2011) proposed writing of international science education standards in a way that allows an interactive process of revision over the long term. By qualification documents that consist recommended verbs in shaping learning outcomes (http://www.kvalifikacije.hr/hr/dokumenti-publikacije, MSES 2013) would help Croatia reach this goal.

Teachers' Attitudes on Curriculum Materials

The majority of teachers in this study fully agreed with the positive changes done in the

experimental science curriculum. From the beginning of schooling up to today, curriculum improvement strives for education progress. There have been many changes in the Republic of Croatia's curriculum (MSE 2005; MSE 2007; MSE 2011; MSE 2018). The curricular reform "School for life" emerged because of the desire to raise the level of quality of education and improve educational outcomes based on European standards (European Commission 2009). The result of this research indicated that most of the teachers believed in progress of outcome levels in the science curriculum. Research by Roehrig et al. (2007) was concerned with the implementation of the curriculum by the teacher because it was not strict, but contained only the basic guidelines and the volume of evidence. This is very similar to the experimental programme in Croatia, where teachers have the ability to form the curriculum less strictly than before and without any professional development programme. Roblin et al. (2018) developed the theoretical model of long-term professional development programmes that are needed to achieve long-lasting changes in teachers' practical knowledge during science curriculum reform. Through research, it turns out that implementation of the curriculum was strongly influenced by the teachers' beliefs about teaching and learning, and the presence of a supportive network at their school sites (Larkin et al. 2009; Roehrig et al. 2007). From this study, it turned out that teacher who generally did not observe changes in the experimental curriculum evaluated both science textbooks and workbooks as very low and disagreed with any improvements in education in the pilot year 2018-2019. Half of the teachers from experimental schools in the study rated the science experimental workbook at a lower thinking level, although the analysis showed it contained a much higher level of thinking activities than the previous ones. Obviously, teachers need to apply outcome-based education to achieve their own goals, but also incorporate outcome based frameworks in curriculum, science program and communication with students. By supporting the outcome based education model, Obaydullah et al. (2020) emphasised the continued transfer of faculty courses to students, teachers and curriculum authors giving them the guidance, activities and tasks designed to help individual progress. This could give the opportunity to academic teachers, educationalists involved in outcome based education, curriculum developers, and teachers a better connection through the Research Practice Partnerships (RPP) as were proposed by Coburn and Penuel (2016). Furthermore, in this study half of the teachers stated that students did not react positively to experimental science textbooks when compared to previous ones. On the contrary, Roblin et al.'s (2018) study of science curriculum materials confirmed positive student outcomes associated with curriculum materials with a larger scope, but also positive teacher outcomes associated with the science curriculum standards and recommended instructional strategies. This study implies that the attitude and opinion of the teacher about the changes (in this case the science curriculum) and curriculum materials are of great importance. Teachers developed a favourable view towards curriculum and material changes whose value is increasing student outcome level, but this can quickly disappear if these ideas are not consolidated and put into practice (Aldahmash et al. 2020).

Further research is required to understand the effects of curriculum material features and textbook and workbook on student learning outcomes.

CONCLUSION

This study aims to draw the attention of the outcome level in the questions of science textbook and workbook written in accordance to curriculum reform documents. Outcome levels in textbooks and workbooks belong to the reproduction of knowledge and understanding dimensions, followed by synthesis of knowledge. Based on this, it is possible to argue that experimental materials should focus more on higher students' competences (application knowledge, evaluate information and new knowledge). The results of experimental textbook show advance of questions at the end of the unit when compared to questions from the beginning of unit and question for repetition. Therefore, the higher-level thinking activities in science textbooks and workbooks are consistent with the curricular reform expectations only to a certain extent.

Teachers from experimental schools are teachers who have used the experimental textbook and workbook and their evaluation is very important for the curricular reform in the Republic of Croat-

ia. Survey results suggest that most teachers notice changes in experimental curricula and experimental textbooks and workbooks and agree with higher level thinking activities and questions in textbook and workbook. Teachers think that experimental materials could not impact more positively on the student's outcome level comparing the previous textbook and workbooks. This study provides valuable information for the revision of textbooks and workbooks during experimental school year 2018-2019, and represents an aid for the design of future material.

RECOMMENDATIONS

Given the study results, the researchers can recommend the following.

The proposed curriculum materials need to improve the format, structure and outcome level of activities and questions in science textbooks and workbooks. Science textbook and workbooks should have practical activities related to experiments oriented to higher thinking outcome levels (analyse, evaluate and create). This could be written in an interactive form giving the instructions for student centred activities. Other activities where higher thinking outcome level could be proposed, such as investigate the environment, constructing some protected places should be recommended in curriculum and supporting materials.

The stakeholders of curriculum reform with publishers need to insure the training of textbooks and workbooks authors for outcome based education.

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