

Application of E-learning Material: Environmental Studies for 3rd Grade of Primary School

Robert Repnik

Faculty of Natural Sciences and Mathematics

University of Maribor

Koroška cesta 160, 2000 Maribor, Slovenia

robert.repnik@uni-mb.si

Bojan Bedrač

Faculty of Arts

University of Maribor

Koroška cesta 160, 2000 Maribor, Slovenia

bojan.bedrac@uni-mb.si

***Abstract.** Nearly two years have passed since we prepared e-learning materials for 3rd grade of primary school. Teachers and their students used the materials frequently during the whole period. We found that the use of social and natural science topics is not evenly distributed. The tests are much less used than learning materials. Structured topics are more frequently used than monolith ones. Teachers have given us satisfactory responses using the materials but not as complete lectures. Our e-learning materials are used mostly for natural science topics. The implication is that students gain natural science and digital competences which are favorable for their age.*

***Keywords:** education, e-learning material, application of e-learning material, natural sciences, competences.*

1 Introduction

In 2008 we ran a project to develop e-learning material for environmental studies for 3rd grade of primary school. Project had a really tight schedule and required special development procedures to meet the deadline [5]. Nevertheless we managed to prepare the materials and put them up for use to all schools in Slovenia. Environmental studies are interdisciplinary area where natural science and social science practically form a fusion. E-learning materials are fully compliant with the curriculum for 3rd grade of primary school [4].

Topics of e-learning materials [6]:

- **Who we are and what we are doing:** In this topic students find the importance of: school and knowledge; production and goods; work, profession and leisure activities; and money.
 - **Me and you, you and us:** wants to teach students about cooperation and tolerance
- between people and why help and solidarity are necessary in the society.
 - **Where we are living:** shows students the institutions like post, shops, galleries, banks, museums and churches. The second part is dedicated to the neighboring states and citizens.
 - **Slovenia, my country:** presents the fundamental information about Slovenia, Slovenian money and symbols of the Slovenian country.
 - **Celebration** wants to teach students about personal celebration, work-free days and holidays in Slovenia and other celebrations that are not work-free days but are very important for the society (e.g. international Women's Day, Earth's Day, World Book Day, and Children's Day).
 - **Once upon a time** wants to show changes through time in the place we are living; about the history, culture and people's customs; songs and games; fairytales, stories and fables.
 - **Me and the nature** explains the position of man in the surrounding environment. Topics about animals and plants want to influence individuals to behave properly.
 - **Me and health** wants to influence the nutrition habits of students. Students must know which food is healthy and its benefits.
 - **Man and nature** is an extension of the topic Me and the nature. Value of water and effects of pollution of all kinds are presented. Important topic is the problem of smoking. We don't want our children to start smoking.
 - **Illnesses** wants to teach students about the symptoms of illnesses and the importance of following doctors prescriptions.
 - **Protection against illnesses** teaches personal hygiene and microbes.

- **What I am able to do** shows what can be done from the paper, how to sew a button, how to apply a patch, how to treat of iron panel and wires, and garbage collection.
- **Things change** shows the changes of goods exposed to air, water and light.
- **Air** show the properties of air and the importance of oxygen for living organisms.
- **Movement** shows how bodies move under the influence of force in the air and in water.
- **Light** shows the importance of illumination and the properties of (sun)light. Especially prevention from sunburns is important.
- **Sky** describes virtual movement of the Sun; night sky; and Polaris.
- **Weather** describes rain, thunder, snow, wind and temperature.
- **Sound** is for describing the properties of sound and how sound is generated. How fast the sound travels in different media.
- **Time** is for teaching the relationships between days, hours, and minutes; how time is measured (digital and analog watch) and what are the proper timelines of events.
- **Looking around** teaches about waste and waste treatment
- **Traffic** teaches types of traffic and influence of traffic on people
- **Transmission of data and information** teaches about communication devices and their use (phone, GSM and internet)
- **Data storage** is meant to teach about storing data to magnetic, optical and electronic media
- **Things and its parts** teach that almost all appliances are built from parts. Shows how parts are connected and why it is important to distinguish the parts of products.

It is evident that some topics are more focused to social science and other to natural science. Our aim in this research was to find how e-learning material is used and which topics are most useful. There are many ways to find the relevant data. In our case we used the data that are logged in LMS Moodle where our learning materials are stored.

In another project "Development of natural science competences" we wanted to include the findings of e-learning materials production and their usage for study of competences [2]. Results of this research are the testing of competences in practice. There are multiple competences to test and one of them is also digital competence [3] [8] [7].

2 Research

In the LMS we have two types of users which are accessing our e-learning materials. For the purpose of

correct methodology we must explain the difference between regular users and guests. For regular users we can track their activities and get their results from the tests. Guests on the other hands are all viewed as a single anonymous user and cannot participate in electronic tests. From perspective of our analysis we have discovered that majority of guest users were actually students in schools or at home. Registered users were teachers. In some cases we find that some regular users have much higher amount of interaction with e-learning materials then the rest of them. Such users (teachers) used their own credentials to log all students in the classroom. They confirm such activity and even explain why they used this approach. They wanted to use electronic tests. Students in the 3rd grade of primary school are not yet good at reading and they also have problems with the text and complex computer interaction [5].

In our case we can take into our research statistics both regular and guest users because we want to know what topics of e-learning materials are viewed most. With the knowledge of most used topics we get valuable feedback which parts of materials are useful. We have also found out that e-learning materials need to be visually plausible [1].

Our research also includes the interview of teachers that use our e-learning material in schools and were not members of the initial team of teachers that evaluated the e-learning materials. These interviews were used to aid the preparing of better manuals for teachers. Additional benefits that were gained from the interviews are the insight to on site usage of learning materials. Authors would prepare better e-learning materials next time for this level of education.

2.1 Electronically available data

LMS Moodle gathers statistics for each course. Therefore we only need to extract data from it. At the beginning we tested if users use our e-learning materials. In Fig. 1 the statistics from Moodle are displayed. Graphs are presented visually and numbers beneath the graphs for more detailed statistics.

There is some regularity in the access to the e-learning materials. At the beginning they were a novelty and many used them. In December 2008 there were testing of e-learning materials on schools hence the spike in all users. Then the access followed the natural order of the school years' timeline. During the no-school period the visits drops significantly but later we see an increase. Why there is an increase in the last two months such as almost never before is still a bit of a mystery but it might be due to new learning material production and comparison of e-learning materials. The second part of electronically available data is the activity report (see Fig. 2). In Table 2 we see that some items have much higher view counts than other. Summing the items in the topics together

we see that topic 8 is much more viewed than any other topic.

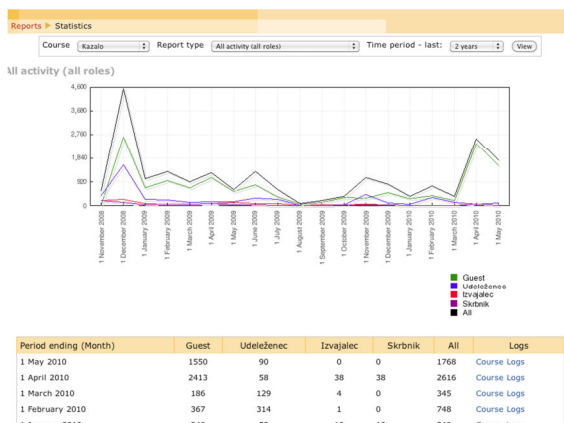


Figure 1: Statistics in Moodle (from November 2008 till May 2010)

Table 1: Overview of access through time

Period	guest	user	teacher	admin	all
1.5.2010	1550	90	0	0	1768
1.4.2010	2413	58	38	38	2616
1.3.2010	186	129	4	0	345
1.2.2010	367	314	1	0	748
1.1.2010	248	52	10	10	348
1.12.2009	490	99	31	23	831
1.11.2009	293	414	51	25	1073
1.10.2009	299	25	19	17	362
1.9.2009	116	22	32	7	178
1.8.2009	53	4	9	7	80
1.7.2009	331	246	69	8	604
1.6.2009	804	287	72	28	1303
1.5.2009	533	148	113	33	603
1.4.2009	1088	140	65	80	1279
1.3.2009	677	119	43	46	907
1.2.2009	962	208	46	38	1326
1.1.2009	680	227	66	17	1029
1.12.2008	2672	1582	229	106	4559
1.11.2008	0	374	187	191	563

Topic 8 is comprised of solely natural science. At the first glance we think that social science topics were most viewed but summing the items together we discovered that that was not true. If we group all topics where we can certainly distinct e-learning materials into social or natural science we see that social science has 2889 views and natural science 2903. Statistically we could say that they are in pair. But if we add engineering topics and human body to the natural science then we get a much higher ration in favor of the natural science 5181.

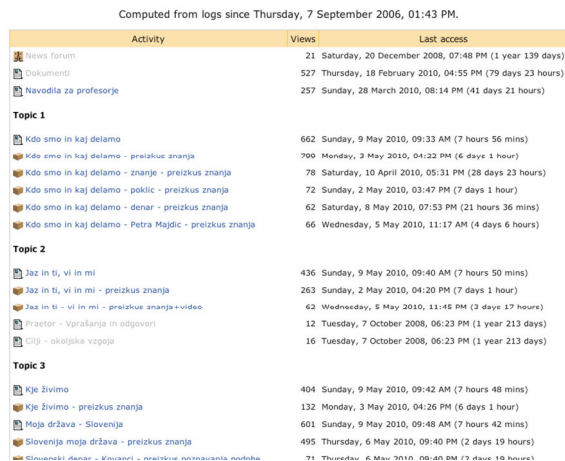


Figure 2: Activity report in Moodle

Table 2: Activities in different e-learning topics

Activity	Views
Manual for teachers	257
Topic 1	662
Who we are and what we are doing	662
Topic 2	436
Me and you, you and us	436
Topic 3	1005
Where we are living	404
Slovenia, my country	601
Topic 4	447
Celebration	447
Topic 5	339
Once upon a time	339
Topic 6	447
Me and the nature	447
Topic 7	1185
Me and health	414
Man and nature	352
Illnesses	226
Protection against illnesses	193
Topic 8	2903
What I am able to do	195
Things change	395
Air	233
Movement	416
Light	346
Sky	173
Weather	415
Sound	366
Time	364
Topic 9	499
Looking around	226
Traffic	273
Topic 10	594
Transmission of data and information	231
Data storage	118

Printable materials	120
Things and its parts	125

We know that all these e-learning materials are available on the web and need to be used on a computer. The numbers we are seeing in Moodle are very pleasing. Evidently students use the e-learning materials and additionally practice digital competences.

2.2 Interview with the teachers

Teachers that use our e-learning materials and were not involved into the review process were interviewed. For the purpose of the project »Development of natural science competences« we only perform interviews with natural science teachers. From analyzing their response we see that they use e-learning materials in four occasions:

- motivation,
- additional explanation,
- repetition and
- tests.

For **motivation** they often show an interesting segment of the e-learning materials at the beginning of the lesson. According to their claims they mostly use movies as problem description and use this to jump-start a discussion. The response of students is a significantly improved motivation for that lesson.

In **additional explanation** teachers have already explained the topic of the lesson. Some even use real experiments in natural science. At the end of a lesson they use parts of e-learning materials – mostly examples for additional explanation and enhanced level of knowledge.

Repetition is a very important step in the process of learning. Teachers use the exercise at the end of topics for this matter. These »questions« are in the e-learning materials because they were built as programmed learning units.

Tests are rarely used on computers. Teachers much rather test the knowledge of their students traditionally. Teachers also said that 45 minutes, which are the typically available for the lessons, does not permit them to log in all users and use electronic tests. Guests on the other hand cannot use electronic tests. E-learning materials can be used in multimedia-equipped classroom but tests need computer classroom and this presents an additional constraint.

3 Conclusions

From the electronic data we can receive valuable information about the behavior of students and teachers. These data help developers to produce better learning materials. In our case we use them also to study natural competences. E-learning materials need high quality manuals for teachers. Many teachers we interviewed said they need special didactical

knowledge how to use e-learning materials at this level of education. They would like to have additional education in shape of workshops because they are not capable of using the manuals for teachers. Even high quality manuals are not enough. Authors of e-learning materials need to follow additional guidelines. E-learning materials have to be organized into a fine structure. Path between topics has to follow a linear type. Much more multimedia elements are needed in primary school materials. According to teachers appliance of learning materials developers should prepare learning material to their fashion (motivation, additional explanation, repetition, and test). Tests are rarely used in classrooms but can be used at home.

Analyzing e-learning materials we found that authors of natural and social science e-learning materials follow different paradigms. Natural science e-learning materials are more structured and have more small topics than social science e-learning materials. In general e-learning materials are useful for improving digital competence of teachers and students.

Acknowledgements

We greatly acknowledge the support of the Ministry of Education and Sport of Republic of Slovenia and European Social Fund in the frame of "Project: Development of Natural Science Competences" at Faculty of Natural Sciences of University of Maribor.



References

- [1] Duh M., Krašna M.: Aesthetic principle in design of distance learning material, *Proceedings / 32nd International Convention MIPRO 2009*, Opatija, 2009, pp. 155-158.
- [2] Europa Official Journal: Key competences for lifelong learning, available at http://europa.eu/legislation_summaries/education_training_youth/lifelong_learning/c11090_en.htm, Accessed: 13th February 2010.
- [3] European parliament: European parliament, available at <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P6-TA-2006-0365+0+DOC+PDF+V0//SL>, Accessed: 17th February 2010.
- [4] Krašna M., Bratina T.: Multimedia E-learning material production for primary school,

- Proceedings CSMW'09 / first Computer Science and Mobility Workshop 2009*, Klagenfurt, 2009, pp. 21-27.
- [5] Krašna M., Bratina T., and Kaučič B.: Differences in e-learning material production according to learners' age and comprehension level, *Conference proceedings / 20th Central European Conference on Information and Intelligent Systems*, Varaždin, 2009, pp. 79-86.
- [6] Krašna M., Bratina T., and Kaučič B.: Implementation of distance learning materials, *Proceedings / 32nd International Convention MIPRO 2009*, Opatija, 2009, pp. 149-154.
- [7] Šorgo A., Špernjak A.: The influence of the computer based laboratory exercises on the development of digital competence, *International Conference InfoKomTeh 2009*, Ljubljana, 2009, pp. 304-317.
- [8] Špernjak A., Šorgo A.: *Predlog za razvoj osnovne kompetence v znanosti in tehnologiji ter digitalne pismenosti pri pouku naravoslovnih predmetov v osnovni šoli s pomočjo računalniško podprtega laboratorijskega dela*, Didakta, vol. 127, pp. 20-25, May 2009.