

**This is an electronic reprint of the original article.  
This reprint *may differ* from the original in pagination and typographic detail.**

**Author(s):** Pirhonen, Juhani; Rasi, Päivi

**Title:** Student-generated instructional videos facilitate learning through positive emotions

**Year:** 2017

**Version:**

**Please cite the original version:**

Pirhonen, J., & Rasi, P. (2017). Student-generated instructional videos facilitate learning through positive emotions. *Journal of Biological Education*, 51(3), 215-227.  
<https://doi.org/10.1080/00219266.2016.1200647>

All material supplied via JYX is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of the repository collections is not permitted, except that material may be duplicated by you for your research use or educational purposes in electronic or print form. You must obtain permission for any other use. Electronic or print copies may not be offered, whether for sale or otherwise to anyone who is not an authorised user.



## Student-generated Instructional Videos Facilitate Learning through Positive Emotions

Journal:	<i>Journal of Biological Education</i>
Manuscript ID	RJBE-2015-0117.R1
Manuscript Type:	Research
Keywords:	Academic emotions, Learner-generated instructional video, Learning journal, Literature review, Multimodal pedagogy

SCHOLARONE™  
Manuscripts

## 1 **Student-generated Instructional Videos Facilitate Learning through** 2 **Positive Emotions**

3 The central focus of this study is a learning method in which university students  
4 produce instructional videos about the content matter as part of their learning  
5 process, combined with other learning assignments. The rationale for this is to  
6 promote a more multimodal pedagogy, and to provide students opportunities for a  
7 more learner-centered, motivating, active, engaging and productive role in their  
8 learning process. As such we designed a “video course” where the students  
9 needed to produce an instructional video which could be used for university  
10 teaching. In addition to producing the video the students needed to write a  
11 literature review of the topic of the video and a learning journal. At the end of the  
12 course the students filled a questionnaire regarding their learning and emotions  
13 during the project. Based on the students’ subjective answers it appeared that  
14 producing a video, combined with writing the literature review can be an efficient  
15 way of learning. Most students found the project emotionally very positive and  
16 regarded it motivating to work on a video which they knew will have use in the  
17 future. This research suggests that a multimodal video project in a higher  
18 education setting enhances learning through increased motivation and positive  
19 emotions.

### 20 **Keywords**

21 Academic emotions; Learner-generated instructional video; Learning journal;  
22 Literature review; Multimodal pedagogy

### 23 **Introduction**

24 The central focus of this study is a learning method in which university students

1  
2  
3  
4  
5  
6  
7  
8  
9 25 produce instructional videos as part of their learning process, combined with other  
10  
11 26 learning assignments. The rationale for this is that when producing videos about the  
12  
13 27 subject matter they are studying, students will learn content as well as transferable skills  
14  
15 28 such as collaboration and problem-solving, and the skills needed in video production  
16  
17 29 (Verran 1992; Jonassen 2000; Jonassen et al. 2003; Shewbridge and Berge 2004;  
18  
19 30 Hakkarainen 2007, 2009). The method is based on the understanding that a more  
20  
21 31 “multimodal pedagogy” (Deacon, Morrison, and Stadler 2005, 75, 83), that is,  
22  
23 32 combining and integrating several representational modes (e.g. text, video, images,  
24  
25 33 voice) into learning materials and assignments may contribute to a more effective  
26  
27 34 learning process (e.g. Peters 2000).

28  
29  
30  
31 35 Another central rationale for engaging university students in the production of  
32  
33 36 instructional videos is providing them with opportunities for a more learner-centered,  
34  
35 37 motivating, active, engaging and productive role in their learning process. Students can  
36  
37 38 no longer be viewed as only passive consumers of knowledge, but also producers and  
38  
39 39 “prosumers” (Lee and McLoughlin 2007; Multisilta 2014). Students’ life-worlds are  
40  
41 40 highly multimodal, and their use of social media in their leisure time is pervasive. The  
42  
43 41 multimodal communication and content creation practices and preferences of these  
44  
45 42 students create challenges for higher education teachers to respond to their life-worlds.

46  
47 43 An important factor in motivating students is the notion of yielding products which  
48  
49 44 involve a sense of purpose and ownership of what was produced, to cite Bonk and Khoo  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 45 (2014, 258), “learners are driven to complete some high-quality, tangible product for  
10  
11 46 others to see, share, use, comment upon, or remix.”

12  
13  
14 47 Very often, as in the case of the present research, the pedagogical rationale for student-  
15  
16 48 generated videos is that the videos will later be re-used as instructional materials  
17  
18 49 (learner-generated content) by their peers (Ellis, Lee, and Tham 2004; Willmott 2014).  
19  
20 50 As such, student-generated videos may serve multiple purposes - they have value to  
21  
22 51 students individually, to peers, as well as possibly to the wider community (Lee and  
23  
24 52 McLoughlin, 2007). Some case studies indicate that student-generated instructional  
25  
26 53 videos have played a supportive role in their peers’ learning processes (e.g. Hakkarainen  
27  
28 54 and Vapalahti 2011; Nordstrom and Korpelainen 2011). Nordstrom and Korpelainen  
29  
30 55 (2011) noted that student-produced videos were often enacted with humour and were  
31  
32 56 therefore less authoritative than typical instructional materials. On the other hand, some  
33  
34 57 research shows that additional guidance is needed for students to take full advantage of  
35  
36 58 the content produced by their peers (van Dijk and Lazonder 2013).

37  
38  
39  
40  
41 59 In higher education settings, in fields other than art, media studies, and communication  
42  
43 60 sciences (see Shewbridge and Berge 2004) students’ own video productions are not yet  
44  
45 61 a commonly used learning method. However, a growing number of teachers are  
46  
47 62 motivated to develop and experiment with more innovative assignment types than, for  
48  
49 63 example, the traditional essay (Leedham 2009). Case studies have indicated that  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 64 integrating university students' video productions into project-based learning (Hung,  
10 65 Keppell, and Jong 2004), case-based teaching (Hakkarainen, Saarelainen, and Ruokamo  
11 66 2007), and drama pedagogy (Hakkarainen and Vapalahti 2011) has supported students'  
12 67 meaningful learning, and especially its' *active, collaborative, contextual, and creative*  
13 68 characteristics (see Hakkarainen and Vapalahti 2011). In engineering education it has  
14 69 been demonstrated that allowing students to use non-conventional tools, such as video  
15 70 for preparing their assignments, can promote deep learning of scientific facts, as well as  
16 71 creativity and motivation (Nordstrom and Korpelainen 2011).

17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27 72 The emotions which higher education students experience during their learning  
28 73 processes play a central role in their motivation to learn and academic achievement  
29 74 (Pekrun et al. 2002; Op't Eynde and Turner 2006). It has been shown that higher  
30 75 education students' video production can facilitate learning through positive emotions  
31 76 such as interest, feelings of challenge, and enthusiasm (Hakkarainen 2009; Hakkarainen  
32 77 and Vapalahti 2011; Willmot, Bramhall, and Radley 2011). The so called "academic  
33 78 emotions", that is, emotions that students experience in school or university settings, are  
34 79 linked to academic learning and achievement so that positive emotions predict high  
35 80 achievement, and negative emotions low achievement (Pekrun et al. 2002).

36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48 81 However, the existing research on higher education students' video productions is  
49 82 comprised of single case studies. Albeit the results are mostly encouraging, they can  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 83 only be considered as tentative, and clearly more research is needed, for example about  
10 84 the possibility of novelty effect (see also Mayberry et al. 2012).

11  
12  
13  
14 85 The aim of this study was to evaluate whether students' video production could be used  
15  
16 86 to promote learning and understanding of the content matter. The study is based on self-  
17  
18 87 reports of university biology students who participated in the "video course". Even  
19  
20 88 though the main focus of the course was to teach video production, the deeper learning  
21  
22 89 of the subject matter was also of equally high importance. The research questions were:  
23  
24 90 (1) How did the combination of learning assignments, i.e. literature review, video  
25  
26 91 production and learning journal, work in terms of student performance and learning  
27  
28 92 experiences? (2) According to the students, what kind of a learning experience was the  
29  
30 93 video production? (3) According to the students, what kind of an emotional experience  
31  
32 94 was the video production?  
33  
34  
35  
36

## 37 95 **Methods**

### 38 39 40 96 *The course*

41  
42  
43 97 This study is based on a 2 ECTS (1 ECTS = 27 h of work) graduate course named  
44  
45 98 "Producing, editing and publishing a video" in the Department of Biological and  
46  
47 99 Environmental Science, University of Jyväskylä, Finland, and the main results are  
48  
49  
50 100 extracted from the questionnaire for the students at the end of the course. The course  
51  
52 101 was organized during the spring semesters of 2011 and 2014, and the first author of this  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 102 article acted as the responsible teacher.

10  
11 103 Both course implementations lasted for five weeks, and they were managed through a  
12  
13 104 learning management system named Optima, widely used in the Finnish universities.

14  
15 105 The course started with initial lectures of about 3 h during which the ideas and

16  
17 106 procedures of the course were explained the students who were given general

18  
19 107 introduction to shooting a video, covering also copyright issues. This latter part was

20  
21 108 given by video production specialist from the University IT-support. Before the lecture

22  
23 109 the students were asked to fill in a short three-item questionnaire in Optima, where we

24  
25 110 asked the reasons for participation, previous experience of shooting videos and

26  
27 111 suitability of the time of the course. On the first lecture all students signed an agreement

28  
29 112 where we asked for permission to use the questionnaire, videos and learning journals for

30  
31 113 the purpose of writing a scientific article. During the initial lecture we also proposed

32  
33 114 possible topics for videos but the students were also allowed to choose any kind of

34  
35 115 relevant topic of their own interest. However, it was highlighted that it should be

36  
37 116 suitable as instructional video in the university.

38  
39 117 The course consisted of three learning assignments: 1) literature review of the topic of

40  
41 118 the video (max 3 pages) and storyboard, 2) learning journals and 3) the video. At the

42  
43 119 end of the course the three components were graded on the scale 0-5, and the average of

44  
45 120 them was the grade of the course. Both literature review and storyboard had to be



1  
2  
3  
4  
5  
6  
7  
8  
9 121 accepted by the responsible teacher before starting filming the video. The  
10 122 recommendation was to return the review and storyboard within two weeks, and the  
11 123 documents were screened for possible plagiarism with URKUND; this system was  
12  
13 124 available only in 2014.  
14  
15  
16  
17  
18 125 We also wanted to see the learning process through learning journals. The idea was to  
19 126 improve student's learning by forcing them to think and reflect their own learning  
20 127 process in the journals. As such the students were instructed to write the journals at least  
21 128 once a week, and in addition to writing what they have learned also to include any kinds  
22 129 of emotions felt during the process. The journals were graded based on the regularity of  
23 130 writing and also on their contents: how well the students were able to express the  
24 131 learning process.  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35 132 Most videos were made in groups of two students but in both years there was one group  
36 133 of three students, and three students wanted to make the video alone (Table 1). The  
37 134 university borrowed video cameras if needed. In 2014 we also allowed students to use  
38 135 their mobile devices for capturing the footage but all students wanted to use the "real"  
39 136 video camera. The recommendation for the length of the video was no more than 5  
40 137 minutes. The students were given four weeks for independent work (i.e. literature  
41 138 review, storyboard, filming). After this the students were given a lecture by the  
42 139 university's IT specialist about Adobe Premiere Elements 11 as editing software.  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 140 Participation to the editing lecture was not obligatory because the students were also  
10  
11 141 allowed to use any other editing software if they wanted. The computer class was  
12  
13 142 reserved for editing for 20 hours, and the teacher was available by phone or e-mail, as  
14  
15 143 he was not with the students all the time.

16  
17  
18 144 At the final meeting (2 h) all students were first asked to fill in the research  
19  
20 145 questionnaire (Table 2) and they were given about 30 minutes to do it. After this all  
21  
22 146 participating students and the teachers watched the produced videos and after each  
23  
24 147 video we discussed it. First the students were given the possibility to express their  
25  
26 148 opinions and then the teachers gave their feedback. After watching the videos the  
27  
28 149 students were given some more time to finalize the questionnaire if needed. The videos  
29  
30 150 were downloaded into the University password protected video repository after the  
31  
32 151 course.

### 33 34 35 36 37 152 ***Participants***

38  
39  
40 153 In total 19 students participated the course, 10 students in 2011 and 9 in 2014 (Table 1).  
41  
42 154 The age of the students ranged between 20 and 42 years (mean  $\pm$  SD 27.1  $\pm$  6.1 years).  
43  
44 155 Most students were from the Department of Biological and Environmental Science but  
45  
46 156 three students came from the Department of Physics and one from the Faculty of ICT.  
47  
48 157 Fourteen participants were postgraduate students, four were undergraduate students and  
49  
50 158 one was doctoral student. In 2011 the course was given in Finnish and in 2014 in  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 159 English as four of the students were exchange students from other countries.

10  
11  
12 160 ***The questionnaire***

13  
14  
15 161 The final 71-item questionnaire consisted of 4 major themes: *i*) personal details, *ii*)  
16  
17 162 teaching, studying and learning in the project, *iii*) emotions related to studying during  
18  
19 163 the project *iv*) videos produced during the project (Table 2). The questionnaire was  
20  
21 164 largely based on a questionnaire originally designed to test the pedagogical model for  
22  
23 165 teaching and meaningful learning (Hakkarainen et al. 2007; Hakkarainen 2009, 2011).  
24  
25 166 The model defines teaching and meaningful learning in terms of 17 process  
26  
27 167 characteristics (e.g. activeness, creativeness, emotional involvement), and their expected  
28  
29 168 outcomes (for a description of the design process of the questionnaire and its previous  
30  
31 169 uses, see Hakkarainen et al. 2007; Hakkarainen 2009, 2011).

32  
33  
34  
35  
36 170 Under *ii* we made 37 statements about teaching and studying during the course on the  
37  
38 171 scale 1 = totally disagree ... 5 = totally agree, and number 3 was "I do not know". In *iii*  
39  
40 172 we presented 20 statements related to emotions during the project. These had to be  
41  
42 173 answered on the scale 0 = not at all ... 4 = very much, and number 2 was "I do not  
43  
44 174 know". After each statement the student could describe the most important reason(s) for  
45  
46 175 the emotion or to the absence of it. In *iv* we asked six open ended questions about  
47  
48 176 producing an instructional video, and here we also gave the possibility for any kinds of  
49  
50 177 comments of the course.  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 178 ***Data analyses***

10  
11 179 For the statements in *ii* and *iii* we tested the possible statistical difference in the yearly  
12  
13 180 (2011, n=10 and 2014 n=9) averages for each statement by independent samples *t*-test  
14  
15 181 using SPSS Statistics 20 software. There were no statistical differences ( $p>0.05$ ) in any  
16  
17 182 statement and consequently the data from these two years were combined (n=19). For  
18  
19 183 each statement we calculated the average and SD. We used also independent samples *t*-  
20  
21 184 test to compare the average values from the statements in *ii* and *iii* for the students who  
22  
23 185 had no earlier experience in video production (n=7) and those who had (n=12), and  
24  
25 186  $p<0.05$  was taken as the level of significance. Depending whether Levene's test  
26  
27 187 indicated significant difference in variances, the *p*-value was selected accordingly  
28  
29 188 ("equal variances assumed / not assumed").  
30  
31  
32  
33

34 189 We also classified the statements of emotions in *iii* into positive and negative ones. The  
35  
36 190 following eight emotions were regarded positive: confidence, enthusiasm, relaxation,  
37  
38 191 joy, interest of the subject matter, relief, sense of community and satisfaction. Eleven  
39  
40 192 negative emotions were tension, frustration, anxiety, disappointment, stress, uncertainty,  
41  
42 193 annoyance, feeling of giving up, insufficiency, shame and fatigue/boredom.  
43  
44 194 "Challenge" could be regarded as positive or negative and thus it was left out of this  
45  
46 195 comparison. By using the average values of both positive and negative feeling  
47  
48 196 statements during the project we calculated an overall average value for these two types  
49  
50 197 of feelings and compared them using *t*-test.  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 198 In addition, coefficient of variation for each feeling was calculated as

10  
11  
12 199 
$$CV = SD / \text{average} * 100 \quad (1)$$

13  
14  
15 200 Logarithmic regression line was fitted for correlation between CV and the average of  
16  
17 201 each feeling.

18  
19  
20  
21 202 **Results and discussion**

22  
23  
24 203 *Combining literature review, video production and learning journal*

25  
26  
27 204 The literature review is an indispensable part of most academic projects. As such the  
28  
29 205 idea for making the students write a literature review prior to producing the videos was  
30  
31 206 above all to make the students properly familiar with the topic, and to create a sturdy  
32  
33 207 ground for the knowledge (Webster and Watson 2002). There was wide variability in  
34  
35 208 the way how the students performed in writing the literature review. The quality of the  
36  
37 209 review was in many cases better with the more advanced students (postgraduate and  
38  
39 210 PhD students) than in the groups with undergraduate students. This kind of result was  
40  
41 211 quite expected as the students are trained to search and find relevant literature and write  
42  
43 212 scientific reports typically from the beginning of the second academic year, and at the  
44  
45 213 masters' level the students should have been quite familiar with this procedure. The  
46  
47 214 review was done in groups and as such all members of the group got the same grade  
48  
49  
50 215 from this part. In the groups where group members were from different study levels, the  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 216 younger (in academic years) students apparently got advantage of the more advanced  
10  
11 217 students.

12  
13  
14 218 In some groups the subject matter was too well known by the group members, and no  
15  
16 219 real learning was achieved at this stage. This was the case when the topic was the  
17  
18 220 subject of the PhD or master thesis. On the other hand in one group the students picked  
19  
20 221 a topic which they knew nothing about and the unawareness of the topic was seen as  
21  
22 222 mistakes and misunderstandings in the review. In the questionnaire the statements  
23  
24 223 related to learning at this stage (“9. Learning about the topic of my video was supported  
25  
26 224 by c) literature review, d) the storyboard”) were usually highly agreed (mean 3.89 SD  
27  
28 225 1.05 and 3.73 SD 1.09, respectively, Table 2). Only one student totally disagreed about  
29  
30 226 the literature review in this respect and the reason was that he had selected a topic of his  
31  
32 227 thesis and he was very familiar with it.

33  
34  
35  
36  
37 228 For producing an instructional video we regard it important that the students finish the  
38  
39 229 literature review and storyboard *before* starting to film the video. This serves as type of  
40  
41 230 quality control and also forces the students to think about the topic deeply and makes  
42  
43 231 them more confident about the subject matter to be presented on the video. Previous  
44  
45 232 research on higher education students as video producers has indicated that when  
46  
47 233 producing videos about a chosen phenomenon, students may skip reading the relevant  
48  
49 234 scientific literature and resort only to their existing knowledge and practical experiences  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 235 (Hakkarainen 2009; Hakkarainen and Vapalahti 2011). Therefore, *combining* more  
10 236 traditional academic assignments with video production is a feasible option for  
11 237 facilitation learning of the subject matter. This would also prevent the pitfall of  
12 238 concentrating too much on the technical rather than conceptual aspects of the video  
13 239 (Schuck and Kearney 2006; Kearney 2011).

14  
15  
16  
17  
18  
19  
20 240 While the literature review was regarded as a base for conceptual and scientific content  
21 241 of the video, storyboard was regarded as a base for content fluency and technical quality  
22 242 of the video, and the importance of storyboard has also been stressed in earlier research  
23 243 (Kearney 2011). Despite the fact that this point was highlighted for the students it  
24 244 seemed to be difficult for some groups or individuals to get the review and storyboard  
25 245 finished before starting to shoot the video. In three cases the review and storyboard  
26 246 were returned only after the course, and in such cases these did not fulfill their goals of  
27 247 improving the quality of the video's content. As such, it seems that there need to be  
28 248 strict deadlines for returning the review and storyboard if this methodology is being  
29 249 used.

30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44 250 The third assignment of the course was to write a learning journal every week, and to  
45 251 enhance students' writing motivation it was graded with the similar weight as the other  
46 252 course assignments. However, this part of the course appeared to be the most difficult  
47 253 for the students. Most students wrote only very little and used the learning journal as a  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 254 diary: they just reported very briefly what they had done during that specific day or  
10  
11 255 week but very little or nothing about their learning, thoughts or emotions. The  
12  
13 256 responsible teacher (JP) commented the journals personally for each student after the  
14  
15 257 second week by trying to direct the writing away from just listing what has been done  
16  
17 258 but however the quality of the journals did not really improve.

19  
20  
21 259 The questionnaire answers indicated wide variability in the usefulness of learning  
22  
23 260 journals in this process. “9. Learning about the topic of my video was supported by  
24  
25 261 learning journals” got an average value of 3.05 (SD 1.22; Table 2) and only one student  
26  
27 262 had graded this statement as 5 (totally agree), but three students had graded this as 1  
28  
29 263 (totally disagree). Also the statement “14. Learning journals helped to understand my  
30  
31 264 own learning” was answered in a quite similar manner (3.11 SD 1.33). In this statement  
32  
33 265 two students totally agreed but four students totally disagreed. One student also  
34  
35 266 mentioned in *iii* that the reason for the feeling of stress was the learning journal.

36  
37  
38  
39 267 Learning journal has previously been indicated to be a very powerful tool for increasing  
40  
41 268 biology students’ cognitive processes and also performance in exam when compared to  
42  
43 269 traditional writing of scientific reports (McCrinkle and Christensen 1995). In that  
44  
45 270 research the writing of learning journals greatly increased students’ understanding of the  
46  
47 271 purpose and process of learning, and consequently also the performance in the final  
48  
49  
50 272 exam. The students of the present study were perhaps too concentrated just on  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



1  
2  
3  
4  
5  
6  
7  
8  
9 273 producing their video, and several simultaneous learning assignments possibly  
10  
11 274 decreased their motivation to write the journal while their focus was in the video. Also,  
12  
13 275 as writing of learning journals is not a common assignment in biology courses the  
14  
15 276 students were not familiar with writing the journal and as such they were unable to see  
16  
17 277 the usefulness and purpose of it in the learning process. As such, the students should  
18  
19 278 have been instructed more in detail in writing their journals.  
20  
21

22  
23 279 From learning point of view this kind of multimodal project can actually improve  
24  
25 280 learning much more than separate assignments. For example Stice (1987) reported how  
26  
27 281 different learning methods affected the retention of information: if the learning method  
28  
29 282 is reading, retention is only 10%, for hearing 26%, for seeing 30%, for seeing and  
30  
31 283 hearing 50%, for saying 70%, and for saying while doing 90%. As such, a video  
32  
33 284 documentary with narration can increase the retention of information drastically instead  
34  
35 285 of, for example, just reading of a textbook. However it must be noted that there are  
36  
37 286 several types of learning styles (Stice 1987), and also each teacher has his/her own  
38  
39 287 preferable learning style. This may be problematic from the student's point of view if  
40  
41 288 the preferred learning style differs greatly from the one that the teacher has.  
42  
43  
44

45  
46 289 The number of students (19) who participated this research was relatively low.  
47  
48 290 However, the average values of the responses in the questionnaire in *ii* and *iii* did not  
49  
50 291 differ significantly between 2011 and 2014. This similarity of responses suggests  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 292 reliability of our data. However, the small number and wide age range of participants in  
10  
11 293 the present research does not allow for discussing the potential effect of age on students'  
12  
13 294 performance.

14  
15  
16  
17 295 *Video production as a learning experience*

18  
19 296 Filming and editing the video appear good ways of learning as the answers for the  
20  
21 297 statements “9. Learning about the topic of my video was supported by e) shooting the  
22  
23 298 video and f) editing the video” were well agreed, 3.94 (SD 1.25) and 4.0 (1.15),  
24  
25 299 respectively (Table 2), and these values were even slightly higher than those related to  
26  
27 300 learning through literature review and storyboard (see above). The statements “21.  
28  
29 301 Making the video helped me to understand different aspects related to the topic of the  
30  
31 302 video” and “25. Producing videos made creative thinking possible” were also strongly  
32  
33 303 agreed (4.11 SD 0.94 and 4.58 SD 0.61, respectively, Table 2).

34  
35  
36  
37 304 There appeared some significant ( $p < 0.05$ ) differences in responses between the students  
38  
39 305 who had prior experience in producing videos and those who produced videos for the  
40  
41 306 first time. The students who had no prior experience in producing video gave  
42  
43 307 significantly higher scores than the students who had experience for the following  
44  
45 308 statements: “8. During the project I learned new issues about producing and publishing  
46  
47 309 a video” (mean $\pm$ SD, 5.0 $\pm$ 0.0 vs. 4.25 $\pm$ 0.62), “9. Learning about the topic of my video  
48  
49 310 was supported by shooting the video” (4.67 $\pm$ 0.82 vs. 3.55 $\pm$ 1.30), “22. To produce a  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 311 video was challenging” (4.43±0.54 vs. 3.17±1.12) and “23. Studying improved my  
10 312 skills for cooperation and communication” (4.57±0.54 vs. 3.75±1.1). On the other hand  
11  
12 313 the statement “19. The course improved my skills and competences needed in my future  
13  
14 314 employment” got significantly higher scores from students with prior experience in  
15  
16 315 producing videos (4.25±0.87) than when the students had no prior experience in video  
17  
18 316 production (3.43±0.54).

19  
20  
21  
22  
23 317 The question whether the video production brought added value to studying and  
24  
25 318 learning when compared to a more traditional way of learning (reading, writing,  
26  
27 319 discussion) was answered “yes” in 18 cases. Only one student disagreed and his reason  
28  
29 320 was that “if the point is to study the subject matter then making a video takes just extra  
30  
31 321 time and as such does not have added value”. The question “28. How did you feel about  
32  
33 322 producing a video for instructional material?” got mainly very positive answers such as  
34  
35 323 meaningful, sensible, innovative, (very) fun, interesting, challenging but meaningful,  
36  
37 324 and nice. One student regarded this as a challenge (she did the video alone) and another  
38  
39 325 said that “it was similar to any routine school work”.

40  
41  
42  
43 326 Important point here is that most students felt that what they were doing was something  
44  
45 327 meaningful as the videos can be used for instructional purposes in university teaching,  
46  
47 328 and will not be buried unused as would happen with written reports. It is also well  
48  
49 329 known that teaching is one of the best ways of learning (e.g. Niess and Walker 2010). In  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 330 order to be able teach something one must first master the topic (Kugel 1993), and  
10  
11 331 “learning through teaching” has also been regarded important by students in another  
12  
13 332 video production project (Mayberry et al. 2012). In addition, creating videos can be  
14  
15 333 regarded as a divergent form of knowledge expression (Bull and Bell 2010). The  
16  
17 334 students have also been reported to be motivated by knowing that the target audience is  
18  
19 335 their peers (Kearney 2011; Bonk and Choo 2014). Taken together, the students of the  
20  
21 336 present video course were highly motivated to study also the subject matter: first, they  
22  
23 337 knew that the material will have further use and second, they were able to show and  
24  
25 338 express their knowledge in the form of a video. Both inspiration and motivation in a  
26  
27 339 video project have been shown to enhance learning (Willmot, Bramhall, and Radley  
28  
29 340 2011).

30  
31  
32  
33  
34 341 The quality of the videos was mainly very good, when it comes to their use as  
35  
36 342 instructional videos. Several of the videos could be regarded as mini-documentaries (a  
37  
38 343 day at a fish farm, fish parasites, freshwater pearl mussel, Newton’s laws of motion) as  
39  
40 344 they give a general introduction to the topic. Other type of videos were instructional  
41  
42 345 “how to” videos (fish respirometry, sampling of benthic invertebrates, induced breeding  
43  
44 346 of African catfish, measurement of feed intake in fish). The length of the videos varied  
45  
46 347 between c. 2 and 6 minutes. From the technical point of view the students regarded  
47  
48 348 their videos quite successful, e.g. “To be honest, it was not perfect but still it was good”.

49  
50  
51 349 One student who did the video alone was disappointed with the result and finally did not  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 350 even consider her video suitable for university teaching (question 27, Table 2). Most  
10 351 students regarded the current format of the course good without needs for changes.

11  
12  
13  
14 352 *Emotions reported by students*

15  
16  
17 353 In general, the students found the video production emotionally very positive. The  
18  
19 354 average score of the positive emotions 2.93 (SD 0.57) was significantly higher  
20  
21 355 ( $p < 0.001$ ) than for the negative ones 1.00 (0.48), on the scale 0 to 4. All positive  
22  
23 356 emotions except “relief” got an average score over two (Figure 1). On the other hand,  
24  
25 357 all emotions which were regarded negative got an average score below 2, and only four  
26  
27 358 of the 11 negative emotions got an average score above 1 (Figure 1). Interestingly, we  
28  
29 359 found a strong negative correlation between the average score of the feeling and average  
30  
31 360 coefficient of variation of each feeling, and the relationship fitted best to a logarithmic  
32  
33 361 regression ( $R^2 = 0.98$ ; Figure 2). This indicates, that the smaller the score the bigger is the  
34  
35 362 variability in the emotion in question. For example, in the cases where almost all  
36  
37 363 students felt no negative emotion about the statement in question, totally different  
38  
39 364 responses from just one or two students increase the SD and consequently CV. This  
40  
41 365 result indicates that during the project negative emotions were experienced only seldom  
42  
43 366 while positive emotions were experienced at least to some extent practically with every  
44  
45 367 student.

46  
47  
48  
49  
50  
51 368 The students with no prior experience in producing videos felt significantly more  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 369 enthusiasm during the project (average score 3.86 SD 0.38) than those who had prior  
10 370 experience (3.42 SD 0.51), which may be due to a novelty effect. This result underlines  
11 371 the importance of novelty and learning new skills for learning and emotional  
12  
13 372 experiences, and should encourage teachers to use unconventional methods for teaching.  
14  
15 373 This finding also supports the criticism against the “digital natives” -concept as those  
16  
17 374 students with no prior experience of producing videos responded most positively  
18  
19 375 (Helsper and Enyon 2010). Otherwise there were no differences in emotions when  
20  
21 376 related to the experience in producing videos.  
22  
23  
24  
25  
26

27 377 Students’ video projects have also previously been shown to be emotionally very  
28  
29 378 positive experiences. For example, Hakkarainen and Vapalahti (2011) got almost  
30  
31 379 identical results to ours, regarding college students’ emotions on a drama course. Also  
32  
33 380 Willmot, Bramhall, and Radley (2011) reported that 80% of the engineering students  
34  
35 381 had enjoyed producing an instructional video. However, the present study reveals an  
36  
37 382 interesting finding that positive emotions are rather universal among the students but  
38  
39 383 there is wide variation in negative emotions.  
40  
41  
42  
43

#### 44 384 **Conclusion**

45  
46 385 Student-generated instructional videos do not only provide a valuable teaching resource  
47  
48 386 for university teachers but they also provide the students the possibility to learn through  
49  
50 387 an unconventional manner. By producing instructional videos the students need to  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 388 master the subject matter before being able to shoot the video, and the conventional  
10 389 literature review as well as the storyboard helps the students to form a proper ground for  
11  
12 390 shooting footage. The students were motivated to produce videos as they knew that  
13  
14  
15 391 those would be used in the future, and the emotions felt by the students during the  
16  
17 392 project were mostly positive. In the current study we lack direct evidence of improved  
18  
19 393 learning when compared to more traditional ways of teaching and learning, but in  
20  
21 394 general, positive emotions have shown to improve learning. As such the results of this  
22  
23 395 research hopefully encourage higher education teachers to include student-generated  
24  
25 396 instructional video courses in their repertoire of stimulating teaching methods.  
26  
27  
28  
29

30 397 **References**

- 31  
32 398 Bonk, C. J., and E. Khoo. 2014. *Adding Some Tec-variety. 100+ Activities for*  
33 399 *Motivating and Retaining Learners Online*. Indiana, USA: Open World Books.  
34  
35 400 Bull, G. L., and G. Bell. 2010. Teaching with Digital Video. In *Teaching with Digital*  
36 401 *Video: Watch, Analyze, Create*, edited by G. L. Bull, and G. Bell G. 1–11. Eugene:  
37 402 ISTE.  
38  
39 403 Deacon, A., A. Morrison, and J. Stadler. 2005 Designing for Learning through  
40 404 Multimodal Production: Film Narrative and Spectatorship in Director’s Cut.  
41 405 *International Journal of Education and Development Using Information and*  
42 406 *Communication Technology* 1 (1): 72–89.  
43  
44 407 Ellis, G., K. S. Lee, and A. Tham. 2004. Learning engineering mechanics through video  
45 408 production. *Proceedings of the 34th ASEE/IEEE Frontiers in Education*  
46 409 *Conference*. [www.fie-conference.org/fie2004/papers/1051.pdf](http://www.fie-conference.org/fie2004/papers/1051.pdf).  
47  
48 410 Hakkarainen, P. 2007. *Promoting Meaningful Learning Through the Integrated Use of*  
49 411 *Digital Videos*. PhD thesis, University of Lapland, Finland.  
50  
51 412 Hakkarainen, P. 2009. Designing and Implementing a PBL Course on Educational  
52 413 Digital Video Production: Lessons Learned from a Design-based Research.  
53 414 *Educational Technology Research and Development* 57(2): 211–228.  
54  
55  
56  
57  
58  
59  
60

- 1  
2  
3  
4  
5  
6  
7  
8  
9 415 Hakkarainen, P. 2011. Promoting Meaningful Learning through Video Production-  
10 416 supported PBL. *Interdisciplinary Journal of Problem-based Learning* 5(1): 34–  
11 417 53.
- 12 418 Hakkarainen, P., T. Saarelainen, and H. Ruokamo. 2007. Towards Meaningful Learning  
13 419 through Digital Video Supported Case Based Teaching. *Australasian Journal of*  
14 420 *Educational Technology* 23(1): 87–109.
- 16 421 Hakkarainen, P., and K. Vapalahti. 2011. Meaningful Learning through Video-  
17 422 supported Forum-theater. *International Journal of Teaching and Learning in*  
18 423 *Higher Education* 23(3): 314–328.
- 20 424 Hargis, J., and S. M. Marotta. 2011. Using Flip Camcorders for Active Classroom  
21 425 Metacognitive Reflection. *Active Learning in Higher Education* 12(1): 35–44.
- 23 426 Helsper, E., and R. Eynon. 2010. Digital natives: where is the evidence? *British*  
24 427 *Educational Research Journal* 36(3): 503–520.
- 25 428 Hung, V. H. K., M. Keppell, and M. S. Y. Jong. 2004. Learners as Producers: Using  
26 429 Project Based Learning to Enhance Meaningful Learning through Digital Video  
27 430 Production. In: *Beyond the Comfort Zone: Proceedings of the 21st ASCILITE*  
28 431 *Conference*, edited by R. Atkinson, C. McBeath, D. Jonas-Dwyer, and R. Phillips,  
29 432 428–436. Perth: Australasian Society for Computers in Learning in Tertiary  
30 433 Education.
- 32 434 Jonassen, D. H. 2000. *Computers as Mindtools for Schools: Engaging Critical*  
33 435 *Thinking*. New Jersey: Prentice-Hall.
- 35 436 Jonassen, D. H., J. Howland, J. Moore, and M. Marra. 2003. *Learning to Solve*  
36 437 *Problems with Technology. A constructivist Perspective (2<sup>nd</sup> ed.)*. Upper Saddle  
37 438 River, NJ: Merrill Prentice Hall.
- 39 439 Kearney, M. 2011. A Learning Design for Student-generated Digital Storytelling.  
40 440 *Learning, Media and Technology* 36(2): 169–188.
- 42 441 Kugel, P. 1993. How Professors Develop as Teachers. *Studies in Higher Education*  
43 442 18(3): 315–328.
- 44 443 Lee, M. J. W., and C. McLoughlin. 2007. Teaching and Learning in the Web 2.0 Era:  
45 444 Empowering Students through Learner-generated Content. *International Journal*  
46 445 *of Instructional Technology and Distance Learning* 4(10).
- 48 446 Leedham, M. 2009. From Traditional Essay to “Ready Steady Cook” Presentation:  
49 447 Reasons for Innovative Changes in Assignments. *Active Learning in Higher*  
50 448 *Education* 10(3): 191–206.
- 52  
53  
54  
55  
56  
57  
58  
59  
60



- 1  
2  
3  
4  
5  
6  
7  
8  
9 449 Mayberry, J, J. Hargis, L. Boles, A. Dugas, D. O'Neill , A. Rivera, and M. Meler. 2012.  
10 450 Exploring Teaching and Learning Using an iTouch Mobile Device. *Active*  
11 451 *Learning in Higher Education* 13(3): 203–217.
- 12 452 McCrindle, A. R., and C. A. Christensen. 1995. The impact of learning journals on  
13 453 metacognitive and cognitive processes and learning performance. *Learning and*  
14 454 *Instruction* 5(2): 167–185.
- 15  
16 455 Multisilta, J. 2014. Editorial in Mobile and Panoramic Video in Education. *Education*  
17 456 *and Information Technologies* 19(3): 565–567.
- 18  
19 457 Niess, M. L., and J. M Walker. 2010. Digital Video in Mathematics Education In  
20 458 *Teaching with Digital Video: Watch, Analyze, Create*, edited by G. L. Bull, and G.  
21 459 Bell G. 39-79. Eugene: ISTE.
- 22  
23 460 Nordstrom, K., and P. Korpelainen. 2011. Creativity and Inspiration for Problem  
24 461 Solving in Engineering Education. *Teaching in Higher Education* 16(4): 439–450.
- 25  
26 462 Op't Eynde, P., and J. E. Turner. 2006. Focusing on the Complexity of Emotion Issues  
27 463 in Academic Learning: A Dynamical Component Systems Approach. *Educational*  
28 464 *Psychology Review* 18(4): 361–376.
- 29  
30 465 Pekrun, R., T. Goetz, W. Tizt, and R. P. Perry. 2002. Academic Emotions in Students'  
31 466 Self-regulated Learning and Achievement: A Program of Qualitative and  
32 467 Quantitative Research. *Educational Psychologist* 37(2): 91–105.
- 33  
34 468 Peters, O. 2000. Digital Learning Environments: New Possibilities and Opportunities.  
35 469 *International Review of Research in Open and Distance Learning* 1(1).
- 36  
37 470 Schuck, S., and M. Kearney. 2006. Capturing Learning Through Student-generated  
38 471 Digital Video. *Australian Educational Computing* 21(1): 15–20.
- 39  
40 472 Shewbridge, W., and Z. L. Berge. 2004. The Role of Theory and Technology in  
41 473 Learning Video Production: The Challenge of Change. *International*  
42 474 *Journal on E-Learning. Corporate, Government, Healthcare, and Higher*  
43 475 *Education* 3(1): 31–39.
- 44  
45 476 Stice, J. E. 1987. Using Kolb's Learning Cycle to Improve Student Learning.  
46 477 *Engineering Education* 77(5): 291–296.
- 47  
48 478 van Dijk, A. M., and A. W. Lazonder. 2013. Scaffolding Students' Use of Learner-  
49 479 generated Content in a Technology-enhanced Inquiry Learning Environment.  
50 480 *Interactive Learning Environments*. DOI: 10.1080/10494820.2013.834828
- 51  
52  
53  
54  
55  
56  
57  
58  
59  
60

- 1  
2  
3  
4  
5  
6  
7  
8  
9 481 Verran, J. 1992. The Use of Video in Transferable Skills Education for Biology Students  
10 482 I. Production of Pilot Videos. *Journal of Further and Higher Education* 16: 96-  
11 483 102.
- 12 484 Webster, J., and R. T. Watson. 2002. Analyzing the Past to Prepare for the Future:  
13 485 Writing a Literature Review. *MIS Quarterly* 26(2): xiii–xxiii.
- 14  
15 486 Willmot, P., M. Bramhall, and K. Radley. 2011. Introducing Audio-visual Media for  
16 487 Inspirational Learning and Positive Engagement. In: *Proceedings of the SEFI*  
17 488 *Annual Conference*, edited by J. Bernardino, and J. C. Quadrado, 420–426. Lisbon,  
18 489 Portugal.
- 19  
20 490 Willmott, C. J. R. 2014. Teaching Bioethics via the Production of Student-generated  
21 491 Videos. *Journal of Biological Education* 49: 127-138.
- 22  
23 492  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9 493 Figure captions.

10  
11 494 Figure 1. Average score of feelings experienced during the student-generated video  
12  
13 495 project. The feelings were classified as positive or negative, but “challenge” was  
14  
15 496 classified as neutral. The scale for answers was from 0 (not at all) to 4 (very much).  
16  
17 497 Error bars denote SD, n=19.

18  
19 498 Figure 2. Relationship between the average of a feeling (as in Fig. 1) and the coefficient  
20  
21 499 of variation (CV) of the same feeling. n=19 for each data point.

22 500  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

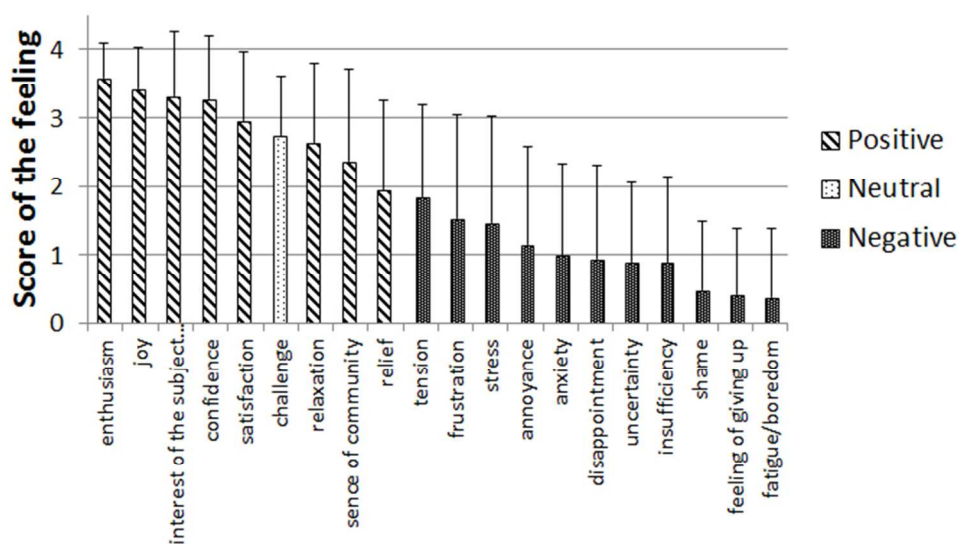


Figure 1. Average score of feelings experienced during the student-generated video project. The feelings were classified as positive or negative, but "challenge" was classified as neutral. The scale for answers was from 0 (not at all) to 4 (very much). Error bars denote SD, n=19.

Table 1. Topics of the videos chosen by students in 2011 and 2014, and the number of students in each group.

Topics of the student-generated videos	Number of students
2011	
Fish parasites	2
Induced breeding of African catfish	2
Fish respirometry	2
Sampling of benthic invertebrates in rivers	1
Newton's laws of motion	3
2014	
A day at a fish farm	2
Measurement of feed intake in fish	1
Fish respirometry (in English)	2
Parasitic stage of freshwater pearl mussel	3
The meaning of roots for plants	1

Table 2. Questionnaire filled by the students at the end of the video-course. For numerical data mean, standard deviation and the number of responses are presented. For open-ended questions no data are shown. In questions 7-25 the scale for answers was 1 (totally disagree) to 5 (totally agree).

	Mean	SD	N
<i>i</i> PERSONAL DETAILS			
1. Name			
2. Age	27.1	6.1	19
3. When did you start studying at the University of Jyväskylä?			
4. Do you have prior experience in producing videos? Yes. Where?			12
Encircle the option(s) in which you have experience			
a) Writing manuscript / storyboard			4
b) Shooting a video			10
c) Editing			12
d) About something else related to producing videos			3
No prior experience			7
<i>ii</i> TEACHING, STUDYING AND LEARNING IN THE PROJECT			
5. How did you familiarize yourself on the topic of your video and writing the manuscript?			
a) I did not read anything about it			0
b) By reading from magazines, journals and/or books			9
c) From the internet			17
d) By asking from my friend(s)			4
e) By going through course materials from other courses			5
f) By asking from the teacher(s)			5
g) By some other means, how?			4
6. How did you familiarize yourself on the technical aspects of producing videos			
a) I did not read anything about it			3
b) By reading from magazines, journals and/or books			1
c) From the internet			12
d) By asking from my friend(s)			6
e) By asking from the teacher(s)			3
f) By some other means, how?			4
7. Teachers considerably supported my studying and learning:			
a) by generating positive ambient	4.58	0.61	19
b) by giving personal feed back of my working	3.79	1.13	19
c) by instructing in questions related to the contents of the videos	4.42	0.84	19
d) by providing clear instructions how to complete the course	4.58	0.51	19
e) by phrasing clearly the goals of the course	4.47	0.70	19
f) by giving feedback and instructions quickly enough	4.53	0.70	19
g) by giving feedback of the essential issues of the video	4.11	1.10	19
8. During the project I learned:			
a) new issues about the topic of my video	4.16	1.30	19
b) new issues about producing and publishing a video	4.53	0.61	19
c) group working methods	3.84	1.34	19
d) problem solving	3.89	1.05	19
9. Learning about the topic of my video was supported by:			
a) familiarizing myself on the topic by reading	3.89	1.41	19

1				
2	b) familiarizing myself on the topic by other means, how?	4.14	1.10	15
3	c) literature review	3.89	1.05	19
4	d) storyboard	3.74	1.10	19
5	e) shooting the video	3.94	1.25	17
6	f) editing the video	4.00	1.15	19
7	g) learning journals	3.05	1.22	19
8	10. I had the possibility to study on my own personal way	4.11	1.02	18
9	11. When studying I was able to use my earlier knowledge of the topic of the video	4.11	1.24	19
10	12. During the course I was able to apply my earlier practical experiences	4.42	0.84	19
11	13. I had the possibility to evaluate my learning during the course	4.26	0.81	19
12	14. Learning journals helped to understand my own learning	3.11	1.33	19
13	15. Studying in this course made it possible to achieve my personal goals	3.89	1.15	19
14	16. Students were committed to work together	4.21	1.18	19
15	17. What I learned during the course can be used later in other instances	4.53	0.61	19
16	18. The course increased my understanding about what I had learned earlier	4.00	0.88	19
17	19. The course improved skills and competencies needed in my future employment	3.95	0.85	19
18	20. The role of the student was to actively search, evaluate and apply information	4.26	0.81	19
19	21. Making the video helped me to understand different aspects related to the topic of the video	4.11	0.94	19
20	22. To produce a video was challenging	3.63	1.12	19
21	23. Studying improved my skills for			19
22	a) problem solving	3.63	0.90	19
23	b) critical thinking	3.68	0.95	19
24	c) acquiring and evaluating information	3.79	0.79	19
25	d) co-operation and communication	4.05	0.97	19
26	24. It was possible for me to affect the contents and execution of the video	4.74	0.56	19
27	25. Producing videos made creative thinking possible	4.58	0.61	19
28				
29	<i>iii</i> FEELINGS RELATED TO STUDYING DURING THE PROJECT			
30	See Figure 1			
31				
32	<i>iv</i> VIDEOS PRODUCED DURING THE PROJECT			
33	26. Were the videos produced during the course suitable for their purpose, that means can they be used for university teaching?			
34	a) Yes			17
35	b) No			1
36	27. Did the video production bring added value to your studying and learning? Compare the situation e.g to a course where the topic of the video would have been treated on a more traditional way, such as reading, writing and discussions.			
37	a) Yes			18
38	b) No			1
39	28. How did you feel about producing a video for teaching material?			
40	29. How would you estimate the technical success of your video?			
41	30. Would you still be ready to produce a video as a part of your studies for teaching material?			
42	a) Yes			19
43	b) No			0
44	31. How would you change the course or is this a good format to do it?			
45	32. Open word (anything related to the course)			
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				