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Student-generated Instructional Videos Facilitate Learning through Positive Emotions

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Manuscript ID	RJBE-2015-0117.R1
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Keywords:	Academic emotions, Learner-generated instructional video, Learning journal, Literature review, Multimodal pedagogy

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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

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

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32 35 Another central rationale for engaging university students in the production of
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34 36 instructional videos is providing them with opportunities for a more learner-centered,
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36 37 motivating, active, engaging and productive role in their learning process. Students can
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38 38 no longer be viewed as only passive consumers of knowledge, but also producers and
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40 39 “prosumers” (Lee and McLoughlin 2007; Multisilta 2014). Students’ life-worlds are
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42 40 highly multimodal, and their use of social media in their leisure time is pervasive. The
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44 41 multimodal communication and content creation practices and preferences of these
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46 42 students create challenges for higher education teachers to respond to their life-worlds.

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49 43 An important factor in motivating students is the notion of yielding products which
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51 44 involve a sense of purpose and ownership of what was produced, to cite Bonk and Khoo
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45 (2014, 258), “learners are driven to complete some high-quality, tangible product for
46 others to see, share, use, comment upon, or remix.”

47 Very often, as in the case of the present research, the pedagogical rationale for student-
48 generated videos is that the videos will later be re-used as instructional materials
49 (learner-generated content) by their peers (Ellis, Lee, and Tham 2004; Willmott 2014).

50 As such, student-generated videos may serve multiple purposes - they have value to
51 students individually, to peers, as well as possibly to the wider community (Lee and
52 McLoughlin, 2007). Some case studies indicate that student-generated instructional
53 videos have played a supportive role in their peers’ learning processes (e.g. Hakkarainen
54 and Vapalahti 2011; Nordstrom and Korpelainen 2011). Nordstrom and Korpelainen
55 (2011) noted that student-produced videos were often enacted with humour and were
56 therefore less authoritative than typical instructional materials. On the other hand, some
57 research shows that additional guidance is needed for students to take full advantage of
58 the content produced by their peers (van Dijk and Lazonder 2013).

59 In higher education settings, in fields other than art, media studies, and communication
60 sciences (see Shewbridge and Berge 2004) students’ own video productions are not yet
61 a commonly used learning method. However, a growing number of teachers are
62 motivated to develop and experiment with more innovative assignment types than, for
63 example, the traditional essay (Leedham 2009). Case studies have indicated that

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

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

81 However, the existing research on higher education students' video productions is
82 comprised of single case studies. Albeit the results are mostly encouraging, they can

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83 only be considered as tentative, and clearly more research is needed, for example about
84 the possibility of novelty effect (see also Mayberry et al. 2012).

85 The aim of this study was to evaluate whether students’ video production could be used
86 to promote learning and understanding of the content matter. The study is based on self-
87 reports of university biology students who participated in the “video course”. Even
88 though the main focus of the course was to teach video production, the deeper learning
89 of the subject matter was also of equally high importance. The research questions were:
90 (1) How did the combination of learning assignments, i.e. literature review, video
91 production and learning journal, work in terms of student performance and learning
92 experiences? (2) According to the students, what kind of a learning experience was the
93 video production? (3) According to the students, what kind of an emotional experience
94 was the video production?

95 **Methods**

96 *The course*

97 This study is based on a 2 ECTS (1 ECTS = 27 h of work) graduate course named
98 “Producing, editing and publishing a video” in the Department of Biological and
99 Environmental Science, University of Jyväskylä, Finland, and the main results are
100 extracted from the questionnaire for the students at the end of the course. The course
101 was organized during the spring semesters of 2011 and 2014, and the first author of this

102 article acted as the responsible teacher.

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

105 The course started with initial lectures of about 3 h during which the ideas and
106 procedures of the course were explained the students who were given general
107 introduction to shooting a video, covering also copyright issues. This latter part was
108 given by video production specialist from the University IT-support. Before the lecture
109 the students were asked to fill in a short three-item questionnaire in Optima, where we
110 asked the reasons for participation, previous experience of shooting videos and
111 suitability of the time of the course. On the first lecture all students signed an agreement
112 where we asked for permission to use the questionnaire, videos and learning journals for
113 the purpose of writing a scientific article. During the initial lecture we also proposed
114 possible topics for videos but the students were also allowed to choose any kind of
115 relevant topic of their own interest. However, it was highlighted that it should be
116 suitable as instructional video in the university.

117 The course consisted of three learning assignments: 1) literature review of the topic of
118 the video (max 3 pages) and storyboard, 2) learning journals and 3) the video. At the
119 end of the course the three components were graded on the scale 0-5, and the average of
120 them was the grade of the course. Both literature review and storyboard had to be

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121 accepted by the responsible teacher before starting filming the video. The
122 recommendation was to return the review and storyboard within two weeks, and the
123 documents were screened for possible plagiarism with URKUND; this system was
124 available only in 2014.

125 We also wanted to see the learning process through learning journals. The idea was to
126 improve student’s learning by forcing them to think and reflect their own learning
127 process in the journals. As such the students were instructed to write the journals at least
128 once a week, and in addition to writing what they have learned also to include any kinds
129 of emotions felt during the process. The journals were graded based on the regularity of
130 writing and also on their contents: how well the students were able to express the
131 learning process.

132 Most videos were made in groups of two students but in both years there was one group
133 of three students, and three students wanted to make the video alone (Table 1). The
134 university borrowed video cameras if needed. In 2014 we also allowed students to use
135 their mobile devices for capturing the footage but all students wanted to use the “real”
136 video camera. The recommendation for the length of the video was no more than 5
137 minutes. The students were given four weeks for independent work (i.e. literature
138 review, storyboard, filming). After this the students were given a lecture by the
139 university’s IT specialist about Adobe Premiere Elements 11 as editing software.

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

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

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

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40 153 In total 19 students participated the course, 10 students in 2011 and 9 in 2014 (Table 1).
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42 154 The age of the students ranged between 20 and 42 years (mean $\pm$ SD 27.1 $\pm$ 6.1 years).
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44 155 Most students were from the Department of Biological and Environmental Science but
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46 156 three students came from the Department of Physics and one from the Faculty of ICT.
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48 157 Fourteen participants were postgraduate students, four were undergraduate students and
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50 158 one was doctoral student. In 2011 the course was given in Finnish and in 2014 in
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English as four of the students were exchange students from other countries.

The questionnaire

The final 71-item questionnaire consisted of 4 major themes: *i*) personal details, *ii*) teaching, studying and learning in the project, *iii*) emotions related to studying during the project *iv*) videos produced during the project (Table 2). The questionnaire was largely based on a questionnaire originally designed to test the pedagogical model for teaching and meaningful learning (Hakkarainen et al. 2007; Hakkarainen 2009, 2011). The model defines teaching and meaningful learning in terms of 17 process characteristics (e.g. activeness, creativeness, emotional involvement), and their expected outcomes (for a description of the design process of the questionnaire and its previous uses, see Hakkarainen et al. 2007; Hakkarainen 2009, 2011).

Under *ii* we made 37 statements about teaching and studying during the course on the scale 1 = totally disagree ... 5 = totally agree, and number 3 was "I do not know". In *iii* we presented 20 statements related to emotions during the project. These had to be answered on the scale 0 = not at all ... 4 = very much, and number 2 was "I do not know". After each statement the student could describe the most important reason(s) for the emotion or to the absence of it. In *iv* we asked six open ended questions about producing an instructional video, and here we also gave the possibility for any kinds of comments of the course.

178 ***Data analyses***

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

189 We also classified the statements of emotions in *iii* into positive and negative ones. The
190 following eight emotions were regarded positive: confidence, enthusiasm, relaxation,
191 joy, interest of the subject matter, relief, sense of community and satisfaction. Eleven
192 negative emotions were tension, frustration, anxiety, disappointment, stress, uncertainty,
193 annoyance, feeling of giving up, insufficiency, shame and fatigue/boredom.
194 "Challenge" could be regarded as positive or negative and thus it was left out of this
195 comparison. By using the average values of both positive and negative feeling
196 statements during the project we calculated an overall average value for these two types
197 of feelings and compared them using *t*-test.

198 In addition, coefficient of variation for each feeling was calculated as

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

200 Logarithmic regression line was fitted for correlation between CV and the average of
201 each feeling.

202 **Results and discussion**

203 *Combining literature review, video production and learning journal*

204 The literature review is an indispensable part of most academic projects. As such the
205 idea for making the students write a literature review prior to producing the videos was
206 above all to make the students properly familiar with the topic, and to create a sturdy
207 ground for the knowledge (Webster and Watson 2002). There was wide variability in
208 the way how the students performed in writing the literature review. The quality of the
209 review was in many cases better with the more advanced students (postgraduate and
210 PhD students) than in the groups with undergraduate students. This kind of result was
211 quite expected as the students are trained to search and find relevant literature and write
212 scientific reports typically from the beginning of the second academic year, and at the
213 masters' level the students should have been quite familiar with this procedure. The
214 review was done in groups and as such all members of the group got the same grade
215 from this part. In the groups where group members were from different study levels, the

216 younger (in academic years) students apparently got advantage of the more advanced
217 students.

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

228 For producing an instructional video we regard it important that the students finish the
229 literature review and storyboard *before* starting to film the video. This serves as type of
230 quality control and also forces the students to think about the topic deeply and makes
231 them more confident about the subject matter to be presented on the video. Previous
232 research on higher education students as video producers has indicated that when
233 producing videos about a chosen phenomenon, students may skip reading the relevant
234 scientific literature and resort only to their existing knowledge and practical experiences

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

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

250 The third assignment of the course was to write a learning journal every week, and to
251 enhance students’ writing motivation it was graded with the similar weight as the other
252 course assignments. However, this part of the course appeared to be the most difficult
253 for the students. Most students wrote only very little and used the learning journal as a

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9 254 diary: they just reported very briefly what they had done during that specific day or
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11 255 week but very little or nothing about their learning, thoughts or emotions. The
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13 256 responsible teacher (JP) commented the journals personally for each student after the
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15 257 second week by trying to direct the writing away from just listing what has been done
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17 258 but however the quality of the journals did not really improve.
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21 259 The questionnaire answers indicated wide variability in the usefulness of learning
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23 260 journals in this process. “9. Learning about the topic of my video was supported by
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25 261 learning journals” got an average value of 3.05 (SD 1.22; Table 2) and only one student
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27 262 had graded this statement as 5 (totally agree), but three students had graded this as 1
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29 263 (totally disagree). Also the statement “14. Learning journals helped to understand my
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31 264 own learning” was answered in a quite similar manner (3.11 SD 1.33). In this statement
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33 265 two students totally agreed but four students totally disagreed. One student also
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35 266 mentioned in *iii* that the reason for the feeling of stress was the learning journal.
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39 267 Learning journal has previously been indicated to be a very powerful tool for increasing
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41 268 biology students’ cognitive processes and also performance in exam when compared to
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43 269 traditional writing of scientific reports (McCrindle and Christensen 1995). In that
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45 270 research the writing of learning journals greatly increased students’ understanding of the
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47 271 purpose and process of learning, and consequently also the performance in the final
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50 272 exam. The students of the present study were perhaps too concentrated just on
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273 producing their video, and several simultaneous learning assignments possibly
274 decreased their motivation to write the journal while their focus was in the video. Also,
275 as writing of learning journals is not a common assignment in biology courses the
276 students were not familiar with writing the journal and as such they were unable to see
277 the usefulness and purpose of it in the learning process. As such, the students should
278 have been instructed more in detail in writing their journals.

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

289 The number of students (19) who participated this research was relatively low.
290 However, the average values of the responses in the questionnaire in *ii* and *iii* did not
291 differ significantly between 2011 and 2014. This similarity of responses suggests

reliability of our data. However, the small number and wide age range of participants in the present research does not allow for discussing the potential effect of age on students' performance.

Video production as a learning experience

Filming and editing the video appear good ways of learning as the answers for the statements “9. Learning about the topic of my video was supported by e) shooting the video and f) editing the video” were well agreed, 3.94 (SD 1.25) and 4.0 (1.15), respectively (Table 2), and these values were even slightly higher than those related to learning through literature review and storyboard (see above). The statements “21. Making the video helped me to understand different aspects related to the topic of the video” and “25. Producing videos made creative thinking possible” were also strongly agreed (4.11 SD 0.94 and 4.58 SD 0.61, respectively, Table 2).

There appeared some significant ($p < 0.05$) differences in responses between the students who had prior experience in producing videos and those who produced videos for the first time. The students who had no prior experience in producing video gave significantly higher scores than the students who had experience for the following statements: “8. During the project I learned new issues about producing and publishing a video” (mean $\pm$ SD, 5.0 $\pm$ 0.0 vs. 4.25 $\pm$ 0.62), “9. Learning about the topic of my video was supported by shooting the video” (4.67 $\pm$ 0.82 vs. 3.55 $\pm$ 1.30), “22. To produce a

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311 video was challenging” (4.43 ± 0.54 vs. 3.17 ± 1.12) and “23. Studying improved my
312 skills for cooperation and communication” (4.57 ± 0.54 vs. 3.75 ± 1.1). On the other hand
313 the statement “19. The course improved my skills and competences needed in my future
314 employment” got significantly higher scores from students with prior experience in
315 producing videos (4.25 ± 0.87) than when the students had no prior experience in video
316 production (3.43 ± 0.54).

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

326 Important point here is that most students felt that what they were doing was something
327 meaningful as the videos can be used for instructional purposes in university teaching,
328 and will not be buried unused as would happen with written reports. It is also well
329 known that teaching is one of the best ways of learning (e.g. Niess and Walker 2010). In

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

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34 341 The quality of the videos was mainly very good, when it comes to their use as
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36 342 instructional videos. Several of the videos could be regarded as mini-documentaries (a
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38 343 day at a fish farm, fish parasites, freshwater pearl mussel, Newton’s laws of motion) as
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40 344 they give a general introduction to the topic. Other type of videos were instructional
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42 345 “how to” videos (fish respirometry, sampling of benthic invertebrates, induced breeding
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44 346 of African catfish, measurement of feed intake in fish). The length of the videos varied
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46 347 between c. 2 and 6 minutes. From the technical point of view the students regarded
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48 348 their videos quite successful, e.g. “To be honest, it was not perfect but still it was good”.
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50 349 One student who did the video alone was disappointed with the result and finally did not
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even consider her video suitable for university teaching (question 27, Table 2). Most students regarded the current format of the course good without needs for changes.

Emotions reported by students

In general, the students found the video production emotionally very positive. The average score of the positive emotions 2.93 (SD 0.57) was significantly higher ($p<0.001$) than for the negative ones 1.00 (0.48), on the scale 0 to 4. All positive emotions except “relief” got an average score over two (Figure 1). On the other hand, all emotions which were regarded negative got an average score below 2, and only four of the 11 negative emotions got an average score above 1 (Figure 1). Interestingly, we found a strong negative correlation between the average score of the feeling and average coefficient of variation of each feeling, and the relationship fitted best to a logarithmic regression ($R^2=0.98$; Figure 2). This indicates, that the smaller the score the bigger is the variability in the emotion in question. For example, in the cases where almost all students felt no negative emotion about the statement in question, totally different responses from just one or two students increase the SD and consequently CV. This result indicates that during the project negative emotions were experienced only seldom while positive emotions were experienced at least to some extent practically with every student.

The students with no prior experience in producing videos felt significantly more

enthusiasm during the project (average score 3.86 SD 0.38) than those who had prior experience (3.42 SD 0.51), which may be due to a novelty effect. This result underlines the importance of novelty and learning new skills for learning and emotional experiences, and should encourage teachers to use unconventional methods for teaching. This finding also supports the criticism against the “digital natives” -concept as those students with no prior experience of producing videos responded most positively (Helsper and Enyon 2010). Otherwise there were no differences in emotions when related to the experience in producing videos.

Students’ video projects have also previously been shown to be emotionally very positive experiences. For example, Hakkarainen and Vapalahti (2011) got almost identical results to ours, regarding college students’ emotions on a drama course. Also Willmot, Bramhall, and Radley (2011) reported that 80% of the engineering students had enjoyed producing an instructional video. However, the present study reveals an interesting finding that positive emotions are rather universal among the students but there is wide variation in negative emotions.

Conclusion

Student-generated instructional videos do not only provide a valuable teaching resource for university teachers but they also provide the students the possibility to learn through an unconventional manner. By producing instructional videos the students need to

388 master the subject matter before being able to shoot the video, and the conventional
389 literature review as well as the storyboard helps the students to form a proper ground for
390 shooting footage. The students were motivated to produce videos as they knew that
391 those would be used in the future, and the emotions felt by the students during the
392 project were mostly positive. In the current study we lack direct evidence of improved
393 learning when compared to more traditional ways of teaching and learning, but in
394 general, positive emotions have shown to improve learning. As such the results of this
395 research hopefully encourage higher education teachers to include student-generated
396 instructional video courses in their repertoire of stimulating teaching methods.

397 **References**

398 Bonk, C. J., and E. Khoo. 2014. *Adding Some Tec-variety. 100+ Activities for*
399 *Motivating and Retaining Learners Online*. Indiana, USA: Open World Books.

400 Bull, G. L., and G. Bell. 2010. Teaching with Digital Video. In *Teaching with Digital*
401 *Video: Watch, Analyze, Create*, edited by G. L. Bull, and G. Bell G. 1–11. Eugene:
402 ISTE.

403 Deacon, A., A. Morrison, and J. Stadler. 2005 Designing for Learning through
404 Multimodal Production: Film Narrative and Spectatorship in Director’s Cut.
405 *International Journal of Education and Development Using Information and*
406 *Communication Technology* 1 (1): 72–89.

407 Ellis, G., K. S. Lee, and A. Tham. 2004. Learning engineering mechanics through video
408 production. *Proceedings of the 34th ASEE/IEEE Frontiers in Education*
409 *Conference*. www.fie-conference.org/fie2004/papers/1051.pdf.

410 Hakkarainen, P. 2007. *Promoting Meaningful Learning Through the Integrated Use of*
411 *Digital Videos*. PhD thesis, University of Lapland, Finland.

412 Hakkarainen, P. 2009. Designing and Implementing a PBL Course on Educational
413 Digital Video Production: Lessons Learned from a Design-based Research.
414 *Educational Technology Research and Development* 57(2): 211–228.

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

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449 Mayberry, J, J. Hargis, L. Boles, A. Dugas, D. O'Neill , A. Rivera, and M. Meler. 2012.
450 Exploring Teaching and Learning Using an iTouch Mobile Device. *Active*
451 *Learning in Higher Education* 13(3): 203–217.

452 McCrindle, A. R., and C. A. Christensen. 1995. The impact of learning journals on
453 metacognitive and cognitive processes and learning performance. *Learning and*
454 *Instruction* 5(2): 167–185.

455 Multisilta, J. 2014. Editorial in Mobile and Panoramic Video in Education. *Education*
456 *and Information Technologies* 19(3): 565–567.

457 Niess, M. L., and J. M Walker. 2010. Digital Video in Mathematics Education In
458 *Teaching with Digital Video: Watch, Analyze, Create*, edited by G. L. Bull, and G.
459 Bell G. 39-79. Eugene: ISTE.

460 Nordstrom, K., and P. Korpelainen. 2011. Creativity and Inspiration for Problem
461 Solving in Engineering Education. *Teaching in Higher Education* 16(4): 439–450.

462 Op't Eynde, P., and J. E. Turner. 2006. Focusing on the Complexity of Emotion Issues
463 in Academic Learning: A Dynamical Component Systems Approach. *Educational*
464 *Psychology Review* 18(4): 361–376.

465 Pekrun, R., T. Goetz, W. Tizt, and R. P. Perry. 2002. Academic Emotions in Students'
466 Self-regulated Learning and Achievement: A Program of Qualitative and
467 Quantitative Research. *Educational Psychologist* 37(2): 91–105.

468 Peters, O. 2000. Digital Learning Environments: New Possibilities and Opportunities.
469 *International Review of Research in Open and Distance Learning* 1(1).

470 Schuck, S., and M. Kearney. 2006. Capturing Learning Through Student-generated
471 Digital Video. *Australian Educational Computing* 21(1): 15–20.

472 Shewbridge, W., and Z. L. Berge. 2004. The Role of Theory and Technology in
473 Learning Video Production: The Challenge of Change. *International*
474 *Journal on E-Learning. Corporate, Government, Healthcare, and Higher*
475 *Education* 3(1): 31–39.

476 Stice, J. E. 1987. Using Kolb's Learning Cycle to Improve Student Learning.
477 *Engineering Education* 77(5): 291–296.

478 van Dijk, A. M., and A. W. Lazonder. 2013. Scaffolding Students' Use of Learner-
479 generated Content in a Technology-enhanced Inquiry Learning Environment.
480 *Interactive Learning Environments*. DOI: 10.1080/10494820.2013.834828

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3
4
5
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7
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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
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493 Figure captions.

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

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

500

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.

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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

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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				
9	10. I had the possibility to study on my own personal way	4.11	1.02	18
10	11. When studying I was able to use my earlier knowledge of the topic of the video	4.11	1.24	19
11	12. During the course I was able to apply my earlier practical experiences	4.42	0.84	19
12	13. I had the possibility to evaluate my learning during the course	4.26	0.81	19
13	14. Learning journals helped to understand my own learning	3.11	1.33	19
14	15. Studying in this course made it possible to achieve my personal goals	3.89	1.15	19
15	16. Students were committed to work together	4.21	1.18	19
16	17. What I learned during the course can be used later in other instances	4.53	0.61	19
17	18. The course increased my understanding about what I had learned earlier	4.00	0.88	19
18	19. The course improved skills and competencies needed in my future employment	3.95	0.85	19
19	20. The role of the student was to actively search, evaluate and apply information	4.26	0.81	19
20	21. Making the video helped me to understand different aspects related to the topic of the video	4.11	0.94	19
21	22. To produce a video was challenging	3.63	1.12	19
22	23. Studying improved my skills for			19
23	a) problem solving	3.63	0.90	19
24	b) critical thinking	3.68	0.95	19
25	c) acquiring and evaluating information	3.79	0.79	19
26	d) co-operation and communication	4.05	0.97	19
27	24. It was possible for me to affect the contents and execution of the video	4.74	0.56	19
28	25. Producing videos made creative thinking possible	4.58	0.61	19
29				
30	iii FEELINGS RELATED TO STUDYING DURING THE PROJECT			
31	See Figure 1			
32				
33	iv VIDEOS PRODUCED DURING THE PROJECT			
34	26. Were the videos produced during the course suitable for their purpose, that means can they be used for university teaching?			
35	a) Yes			17
36	b) No			1
37	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.			
38	a) Yes			18
39	b) No			1
40	28. How did you feel about producing a video for teaching material?			
41	29. How would you estimate the technical success of your video?			
42	30. Would you still be ready to produce a video as a part of your studies for teaching material?			
43	a) Yes			19
44	b) No			0
45	31. How would you change the course or is this a good format to do it?			
46	32. Open word (anything related to the course)			
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