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Student-generated Instructional Videos Facilitate Learning through Positive Emotions

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Student-generated Instructional Videos Facilitate Learning through Positive Emotions

The central focus of this study is a learning method in which university students produce instructional videos about the content matter as part of their learning process, combined with other learning assignments. The rationale for this is to promote a more multimodal pedagogy, and to provide students opportunities for a more learner-centered, motivating, active, engaging and productive role in their learning process. As such we designed a "video course" where the students needed to produce an instructional video which could be used for university teaching. In addition to producing the video the students needed to write a literature review of the topic of the video and a learning journal. At the end of the course the students filled a questionnaire regarding their learning and emotions during the project. Based on the students' subjective answers it appeared that producing a video, combined with writing the literature review can be an efficient way of learning. Most students found the project emotionally very positive and regarded it motivating to work on a video which they knew will have use in the future. This research suggests that a multimodal video project in a higher education setting enhances learning through increased motivation and positive 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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2	25	produce instructional videos as part of their learning process, combined with other
2	26	learning assignments. The rationale for this is that when producing videos about the
2	27	subject matter they are studying, students will learn content as well as transferable skills
2	28	such as collaboration and problem-solving, and the skills needed in video production
2	29	(Verran 1992; Jonassen 2000; Jonassen et al. 2003; Shewbridge and Berge 2004;
3	30	Hakkarainen 2007, 2009). The method is based on the understanding that a more
3	31	"multimodal pedagogy" (Deacon, Morrison, and Stadler 2005, 75, 83), that is,
3	32	combining and integrating several representational modes (e.g. text, video, images,
3	33	voice) into learning materials and assignments may contribute to a more effective
3	34	learning process (e.g. Peters 2000).
3	35	Another central rationale for engaging university students in the production of
3	86	instructional videos is providing them with opportunities for a more learner-centered,
3	87	motivating, active, engaging and productive role in their learning process. Students can
3	88	no longer be viewed as only passive consumers of knowledge, but also producers and
3	39	"prosumers" (Lee and McLoughlin 2007; Multisilta 2014). Students' life-worlds are
4	10	highly multimodal, and their use of social media in their leisure time is pervasive. The
4	1	multimodal communication and content creation practices and preferences of these
4	12	students create challenges for higher education teachers to respond to their life-worlds.
/	13	An important factor in motivating students is the notion of yielding products which
4	4	involve a sense of purpose and ownership of what was produced, to cite Bonk and Khoo

45 (2014, 258), "learners are driven to complete some high-quality, tangible product for46 others to see, share, use, comment upon, or remix."

Very often, as in the case of the present research, the pedagogical rationale for student-generated videos is that the videos will later be re-used as instructional materials (learner-generated content) by their peers (Ellis, Lee, and Tham 2004; Willmott 2014). As such, student-generated videos may serve multiple purposes - they have value to students individually, to peers, as well as possibly to the wider community (Lee and McLoughlin, 2007). Some case studies indicate that student-generated instructional videos have played a supportive role in their peers' learning processes (e.g. Hakkarainen and Vapalahti 2011; Nordstrom and Korpelainen 2011). Nordstrom and Korpelainen (2011) noted that student-produced videos were often enacted with humour and were therefore less authoritative than typical instructional materials. On the other hand, some research shows that additional guidance is needed for students to take full advantage of the content produced by their peers (van Dijk and Lazonder 2013). In higher education settings, in fields other than art, media studies, and communication 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

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

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

Both course implementations lasted for five weeks, and they were managed through a learning management system named Optima, widely used in the Finnish universities. The course started with initial lectures of about 3 h during which the ideas and procedures of the course were explained the students who were given general introduction to shooting a video, covering also copyright issues. This latter part was given by video production specialist from the University IT-support. Before the lecture the students were asked to fill in a short three-item questionnaire in Optima, where we asked the reasons for participation, previous experience of shooting videos and suitability of the time of the course. On the first lecture all students signed an agreement where we asked for permission to use the questionnaire, videos and learning journals for the purpose of writing a scientific article. During the initial lecture we also proposed possible topics for videos but the students were also allowed to choose any kind of relevant topic of their own interest. However, it was highlighted that it should be suitable as instructional video in the university.

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

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

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

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

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Participation to the editing lecture was not obligatory because the students were also allowed to use any other editing software if they wanted. The computer class was reserved for editing for 20 hours, and the teacher was available by phone or e-mail, as he was not with the students all the time. At the final meeting (2 h) all students were first asked to fill in the research questionnaire (Table 2) and they were given about 30 minutes to do it. After this all participating students and the teachers watched the produced videos and after each video we discussed it. First the students were given the possibility to express their opinions and then the teachers gave their feedback. After watching the videos the students were given some more time to finalize the questionnaire if needed. The videos were downloaded into the University password protected video repository after the

151 course.

152 Participants

153 In total 19 students participated the course, 10 students in 2011 and 9 in 2014 (Table 1).

154 The age of the students ranged between 20 and 42 years (mean \pm SD 27.1 \pm 6.1 years).

155 Most students were from the Department of Biological and Environmental Science but

- three students came from the Department of Physics and one from the Faculty of ICT.
- 157 Fourteen participants were postgraduate students, four were undergraduate students and
- 158 one was doctoral student. In 2011 the course was given in Finnish and in 2014 in

159 English as four of the students were exchange students from other countries.

The questionnaire

161	The final 71-item questionnaire consisted of 4 major themes: <i>i</i>) personal details, <i>ii</i>)
162	teaching, studying and learning in the project, <i>iii</i>) emotions related to studying during
163	the project <i>iv</i>) videos produced during the project (Table 2). The questionnaire was
164	largely based on a questionnaire originally designed to test the pedagogical model for
165	teaching and meaningful learning (Hakkarainen et al. 2007; Hakkarainen 2009, 2011).
166	The model defines teaching and meaningful learning in terms of 17 process
167	characteristics (e.g. activeness, creativeness, emotional involvement), and their expected
168	outcomes (for a description of the design process of the questionnaire and its previous
169	uses, see Hakkarainen et al. 2007; Hakkarainen 2009, 2011).
170	Under <i>ii</i> we made 37 statements about teaching and studying during the course on the
170	onder <i>u</i> we made 57 statements about teaching and studying during the course on the
171	scale 1 = totally disagree 5 = totally agree, and number 3 was "I do not know". In iii
170 171 172	scale $1 =$ totally disagree $5 =$ totally agree, and number 3 was "I do not know". In <i>iii</i> we presented 20 statements related to emotions during the project. These had to be
170 171 172 173	scale 1 = totally disagree 5 = totally agree, and number 3 was "I do not know". In <i>iii</i> 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
171 172 173 174	scale 1 = totally disagree 5 = totally agree, and number 3 was "I do not know". In <i>iii</i> 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
171 172 173 174 175	scale 1 = totally disagree 5 = totally agree, and number 3 was "I do not know". In <i>iii</i> 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 <i>iv</i> we asked six open ended questions about
 171 172 173 174 175 176 	scale 1 = totally disagree 5 = totally agree, and number 3 was "I do not know". In <i>iii</i> 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 <i>iv</i> we asked six open ended questions about producing an instructional video, and here we also gave the possibility for any kinds of
 171 172 173 174 175 176 177 	Solider <i>ii</i> we made 37 statements about teaching and studying during the course on the scale $1 = \text{totally disagree} \dots 5 = \text{totally agree}$, and number 3 was "I do not know". In <i>iii</i> we presented 20 statements related to emotions during the project. These had to be answered on the scale $0 = \text{not}$ at all $\dots 4 = \text{very much}$, 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 <i>iv</i> 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.

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178 Data analyses

179	For the statements in <i>ii</i> and <i>iii</i> we tested the possible statistical difference in the yearly
180	(2011, n=10 and 2014 n=9) averages for each statement by independent samples <i>t</i> -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 <i>t</i> -
184	test to compare the average values from the statements in <i>ii</i> and <i>iii</i> 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").
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189	We also classified the statements of emotions in <i>ui</i> 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 <i>t</i> -test.

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

CV = SD / average * 100 (1)

200 Logarithmic regression line was fitted for correlation between CV and the average of201 each feeling.

202 Results and discussion

203 Combining literature review, video production and learning journal

The literature review is an indispensable part of most academic projects. As such the idea for making the students write a literature review prior to producing the videos was above all to make the students properly familiar with the topic, and to create a sturdy ground for the knowledge (Webster and Watson 2002). There was wide variability in the way how the students performed in writing the literature review. The quality of the review was in many cases better with the more advanced students (postgraduate and PhD students) than in the groups with undergraduate students. This kind of result was quite expected as the students are trained to search and find relevant literature and write scientific reports typically from the beginning of the second academic year, and at the masters' level the students should have been quite familiar with this procedure. The review was done in groups and as such all members of the group got the same grade 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 advanced217 students.

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

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

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.

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

254	diary: they just reported very briefly what they had done during that specific day or
255	week but very little or nothing about their learning, thoughts or emotions. The
256	responsible teacher (JP) commented the journals personally for each student after the
257	second week by trying to direct the writing away from just listing what has been done
258	but however the quality of the journals did not really improve.
259	The questionnaire answers indicated wide variability in the usefulness of learning
260	journals in this process. "9. Learning about the topic of my video was supported by
261	learning journals" got an average value of 3.05 (SD 1.22; Table 2) and only one student
262	had graded this statement as 5 (totally agree), but three students had graded this as 1
263	(totally disagree). Also the statement "14. Learning journals helped to understand my
264	own learning" was answered in a quite similar manner (3.11 SD 1.33). In this statement
265	two students totally agreed but four students totally disagreed. One student also
266	mentioned in <i>iii</i> that the reason for the feeling of stress was the learning journal.
267	Learning journal has previously been indicated to be a very powerful tool for increasing
268	biology students' cognitive processes and also performance in exam when compared to
269	traditional writing of scientific reports (McCrindle and Christensen 1995). In that
270	research the writing of learning journals greatly increased students' understanding of the
271	purpose and process of learning, and consequently also the performance in the final
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.
270	From looming point of view this bind of multimodal ansight and actually immerse
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 <i>ii</i> and <i>iii</i> 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.

295 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

300 learning through literature review and storyboard (see above). The statements "21.

301 Making the video helped me to understand different aspects related to the topic of the

302 video" and "25. Producing videos made creative thinking possible" were also strongly

303 agreed (4.11 SD 0.94 and 4.58 SD 0.61, respectively, Table 2).

304 There appeared some significant (p < 0.05) differences in responses between the students

305 who had prior experience in producing videos and those who produced videos for the

306 first time. The students who had no prior experience in producing video gave

307 significantly higher scores than the students who had experience for the following

308 statements: "8. During the project I learned new issues about producing and publishing

a video" (mean±SD, 5.0±0.0 vs. 4.25±0.62), "9. Learning about the topic of my video

310 was supported by shooting the video" $(4.67\pm0.82 \text{ vs. } 3.55\pm1.30)$, "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).
015	
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

order to be able teach something one must first master the topic (Kugel 1993), and "learning through teaching" has also been regarded important by students in another video production project (Mayberry et al. 2012). In addition, creating videos can be regarded as a divergent form of knowledge expression (Bull and Bell 2010). The students have also been reported to be motivated by knowing that the target audience is their peers (Kearney 2011; Bonk and Choo 2014). Taken together, the students of the present video course were highly motivated to study also the subject matter: first, they knew that the material will have further use and second, they were able to show and express their knowledge in the form of a video. Both inspiration and motivation in a video project have been shown to enhance learning (Willmot, Bramhall, and Radley 2011).

The quality of the videos was mainly very good, when it comes to their use as instructional videos. Several of the videos could be regarded as mini-documentaries (a day at a fish farm, fish parasites, freshwater pearl mussel, Newton's laws of motion) as they give a general introduction to the topic. Other type of videos were instructional "how to" videos (fish respirometry, sampling of benthic invertebrates, induced breeding of African catfish, measurement of feed intake in fish). The length of the videos varied between c. 2 and 6 minutes. From the technical point of view the students regarded their videos quite successful, e.g. "To be honest, it was not perfect but still it was good". One student who did the video alone was disappointed with the result and finally did not

even consider her video suitable for university teaching (question 27, Table 2). Most

- 351 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.

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

369	enthusiasm during the project (average score 3.86 SD 0.38) than those who had prior
370	experience (3.42 SD 0.51), which may be due to a novelty effect. This result underlines
371	the importance of novelty and learning new skills for learning and emotional
372	experiences, and should encourage teachers to use unconventional methods for teaching.
373	This finding also supports the criticism against the "digital natives" -concept as those
374	students with no prior experience of producing videos responded most positively
375	(Helsper and Enyon 2010). Otherwise there were no differences in emotions when
376	related to the experience in producing videos.
377	Students' video projects have also previously been shown to be emotionally very
377 378	Students' video projects have also previously been shown to be emotionally very positive experiences. For example, Hakkarainen and Vapalahti (2011) got almost
377 378 379	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
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 377 378 379 380 381 382 	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

384 Conclusion

385 Student-generated instructional videos do not only provide a valuable teaching resource 386 for university teachers but they also provide the students the possibility to learn through 387 an unconventional manner. By producing instructional videos the students need to

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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.

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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.



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

Journal of Biological Education

Table 2. Questionnaire fill	ed by the stude	nts at the end of the vio	deo-course. For i	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).

7		Mean	SD	Ν
8	i PERSONAL DETAILS			
9	1. Name			
10	2. Age	27.1	6.1	19
11 12	3. When did you start studying at the University of Jyväskylä?			
13	4. Do you have prior experience in producing videos?			
14	Yes. Where?			12
15	Encircle the option(s) in which you have experience			
16	a) Writing manuscript / storyboard			4
17	b) Shooting a video			10
18	c) Editing			12
19	 d) About something else related to producing videos 			3
20 21	No prior experience			7
21 22				
23	ii TEACHING, STUDYING AND LEARNING IN THE PROJECT			
24	5. How did you familiarize yourself on the topic of your video and writing the manuscript?			
25	a) I did not read anything about it			0
26	b) By reading from magazines, journals and/or books			9
27	c) From the internet			17
28	d) By asking from my friend(s)			4
29 30	e) By going through course materials from other courses			5
31	f) By asking from the teacher(s)			5
32	g) By some other means, how?			4
33	6. How did you familiarize yourself on the technical aspects of producing videos			-
34	a) I did not read anything about it			3
35	b) By reading from magazines, journals and/or books			1
36	c) From the internet			12
37	d) By asking from my friend(s)			6
30 30	e) By asking from the teacher(s)			3
40	7 Too share considerable concentral recentulation and locarian			4
41	7. Teacher's considerably supported my studying and learning:			
42	a) by generating positive ambient	4.58	0.61	19
43	 b) by giving personal feed back of my working 	3.79	1.13	19
44 45	c) by instructing in questions related to the contents of the videos	4.42	0.84	19
45 46	d) by providing clear instructions how to complete the course	4.58	0.51	19
47	e) by phrasing clearly the goals of the course	4.47	0.70	19
48 40	f) by giving feedback and instructions quickly enough	4.53	0.70	19
49 50	g) by giving feedback of the essential issues of the video	4.11	1.10	19
51	8. During the project I learned:			
52 52	a) new issues about the topic of my video	4.16	1.30	19
ეკ 54	b) new issues about producing and publishing a video	4.53	0.61	19
55	c) group working methods	3.84	1.34	19
56 57	d) problem solving	3.89	1.05	19
57				
58	9. Learning about the topic of my video was supported by:			

2 0) animaturing investion the colur. by Other Inteals, How (************************************	1	b) familiarising musclf on the tanic bu other means, how?		4.40	45
c) interature review 3.89 1.05 19 d) stoyboard 3.74 1.10 19 e) shooting the video 3.94 1.25 17 f) editing the video 3.94 1.25 17 g) eleming journals 3.05 1.22 19 10. I had the possibility to study on my own personal way 4.11 1.02 18 11. When studying lwas able to use my earlier knowledge of the topic of the video 4.11 1.42 19 12. During the course lwas able to apply my varile practical experiences 4.42 0.81 19 13. I had the possibility to evaluate my learning during the course 4.26 0.81 19 15. Students were committed to work together 4.21 1.18 19 17. What Hearned during the course can be used later in other instances 4.33 0.61 19 20. The role of the student was to actively search, evaluate and apply information 4.26 0.81 19 21. Making the video helped me to understand different aspects related to the topic of the 4.11 0.44 19 22. To produce a video was challenging <t< td=""><td>2</td><td>b) raminarizing mysell on the topic by other means, now?</td><td>4.14</td><td>1.10</td><td>15</td></t<>	2	b) raminarizing mysell on the topic by other means, now?	4.14	1.10	15
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6 e) shooting the video 4.00 1.55 17 7 f) editing the video 4.00 1.55 19 9 g) learning journals 3.05 1.22 18 10 10. I had the possibility to study on my own personal way 4.11 1.02 18 11 Hown studying lwas able to use my earlier knowledge of the topic of the video 4.11 1.24 19 12 During the course l was able to apply my earlier practical experiences 4.26 0.84 19 13. I had the possibility to evaluate my learning during the course 4.26 0.84 19 14 Larning journals helped to understand my own learning 3.11 1.33 19 15. Studying in this course mode the possibile to achieve my personal goals 3.89 1.15 19 17. What I learned during the course course can be used later in other instances 4.53 0.61 19 20. The roles of the student was to actively search, evaluate and apply information 4.26 0.81 19 21. Making the video helped me to understand different aspects related to the topic of the video 0.81 19 22. To produce a video was challenging 3.63 <td>5</td> <td>d) storyboard</td> <td>3.74</td> <td>1.10</td> <td>19</td>	5	d) storyboard	3.74	1.10	19
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