Learning from video examples: Does instructor ethnicity (Western,Non-Western) affect test performance and self-efficacy of students from Vocational education?

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Abstract

Learning from video modeling examples where a human instructor demonstrates and explains how to carry out a learning task is used frequently because it is effective for the learning outcomes of students. Despite the popularity of video modeling examples, characteristics of the instructor (e.g., gender, ethnicity) have not been investigated frequently. Therefore, results differ in previous studies but the model-observer similarity hypothesis does suggest that instructor characteristics could affect learning. Consequently, current study investigated the possibility of instructor's ethnicity having an effect on the test performance and self-efficacy from students of Vocational education when watching video modeling examples. The Vocational education students (N = 36) were randomly divided into two conditions (Western instructor, Non-Western instructor). The content of the video modeling examples were kept equal as well as the gender and age of the instructors. The students participated in a pretest and posttest about mathematical problems (fractions) and answered questions about mental effort and self-efficacy after making the pretest and after watching the video modeling examples, the students also gave a score for the quality of the instruction after watching the video modeling examples. Results did not show a significant effect (p > .05) of instructor's ethnicity on the test performance and self-efficacy of students. However, there was a significant effect (p < .05) of instructor's ethnicity on the scores students gave for the quality of the instruction. Current research suggests that instructor's ethnicity does not need to be taken into account when designing video modeling examples for students.

Keywords: Ethnicity; Self-Efficacy; Mental Effort; Test Performance; Mental Effort; MOS Hypothesis; Video Modeling Examples

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Introduction

Learning from video examples: Does instructor ethnicity (Western/Non-Western) affect test performance and self-efficacy of students?

The medium of video is incredibly popular nowadays, sharing videos, pictures, music, and audio has become faster in the past years which also makes it easier to have access to videos. We can observe this growth of multimedia sharing in formal (e.g., as part of Moocs and flipped classrooms) and informal learning (e.g., YouTube, Khan Academy, CK-12). There is a massive amount of videos available, a part of these videos are made especially for instructional objectives (Bétrancourt & Kalliopi, 2018).

One type of instructional videos are video modeling examples, they are used for instructional purposes which are very popular in education. Video modeling examples are short demonstration videos in which the instructor explains how to carry out certain tasks (Van der Meij & Van der Meij, 2013; Van Gog & Rummel, 2010). Video modeling examples are especially used in blended learning environments and have the great benefit of being accessible anywhere you are. It has been known for decades that learning by observing others is an effective learning method. Bandura (1977) showed in a study that people learn by observing others while afterward imitating the behavior they observed. Therefore, people do not only learn from their own experience. Research has shown that video modeling examples are effective for learning and self-efficacy (De Koning, Hoogerheide, & Boucheix, 2018). They are used by teachers as a tool for their lectures (Chen and Wu, 2015; Korving et al., 2016; Traphagan et al., 2010) also as movie clips with short explanations (e.g., Day, 2008) but also to help students carry out certain tasks and as tool to stimulate self-efficacy (Ayres et al., 2009; Van der Meij & Van der Meij, 2013), thus schools make good use of the benefits

from video modeling examples.

However, given the widespread use of video modeling examples in practice, research on the conditions under which they are most conducive to promote learning and self-efficacy is important to take into account. There is demand for more evidence-based design factors when designing video modeling examples that promote learning and self-efficacy in students, the most important factor is the choice of the instructor, current study wants to contribute to this demand. Thus, present study investigates if similarities between the learner and instructor in terms of ethnicity could have an effect on the learning outcomes and self-efficacy of students when they are learning a task, as foretold by the model-observer similarity hypothesis.

Model-observer similarity

The MOS hypothesis which is very similar to the similarity-attraction hypothesis Moreno & Flowerday, 2006) proposes that video modeling examples invite students to compare themselves with the instructor. Because modeling leads to social comparison, the efficiency of video modeling examples partially depends on how many similarities the learner perceives between themselves and the instructor (Johnson & Lammers, 2012; Bandura, 1997). Students compare themselves with the instructor, and the more the students perceive themselves as similar to the instructor, the more effect it will have on the self-efficacy of students (Bandura, 1997). Consequently, the instructor will be able to persuade the students to listen and learn more which could result in higher learning outcomes (Bandura, 1997; Johnson & Lammers, 2012; Schunk, 1987). Thus, when the students perceive a lot of differences between themselves and the instructor there will not be much influence on self-efficacy (Bandura, 1994).

Besides the above-mentioned affective variables, self-efficacy is also an important factor which has a positive influence on learning outcomes and academic motivation (Schunk, 2003). The more students believe in their capabilities, the more mental effort they are prepared to invest in a learning task (Bandura, 1997).

Because self-efficacy is such an important factor, several studies investigated which designing factors have an effect on the learning and self-efficacy of students, such as the presence of the instructor's face or picture in video modeling examples (e.g., Wang & Antonenko, 2017) or attentional cues such as gestures and symbols (e.g., Wang, Pi, & Hu, 2019) and characteristics of the instructor (e.g., Fiorella & Mayer, 2018). Previous research focused specifically on three characteristics of the instructor: gender (e.g., Garcia-Rodicio, 2012; Hoogerheide, van Wermeskerken, van Nassau, & van Gog, 2018), age and expertise (Hoogerheide, van Wermeskerken, Loyens, & van Gog, 2016; Hoogerheide, van Wermeskerken, van Nassau, & van Gog, 2018). The model-observer similarity hypothesis was used (Garcia-Rodicio, 2012; Hoogerheide, van Wermeskerken, van Nassau, & van Gog, 2018) to explain the perceived similarities such as age between instructor and students which suggests that similar factors (e.g., gender, age) could matter.

Despite the research that has been done there have been mixed findings for the model-observer similarity effect (e.g., Fiorella & Mayer, 2018; Hoogerheide et al., 2018) where there was no effect of perceived similarities (e.g., age and gender) between instructor and student on test performance and self-efficacy. A possible explanation for the mixed findings could be that ethnicity could also be a characteristic which enhances the MOS effects, this has already been argued in previous studies about the MOS hypothesis (Finkelstein, Yarzebinski, Vaughn, & Cassell, 2013). Therefore, current study focuses on MOS in terms of ethnicity.

Model-observer similarity in ethnicity

Ethnicity is also an important characteristic of a person which is always visible, it also fits in the model-observer similarity hypothesis. Ethnicity is defined as a group of people who originate, are born or raised in the same country (Braun, Wolfgang, & Dickersin, 2013. According to the MOS hypothesis it is predicted that students would benefit more from an instructor that is perceived as similar in ethnicity. Previous research did not investigate this expectation yet (Bellini & Akullian, 2007; Finkelstein, Yarzebinski, Vaughn, & Cassell, 2013; Hoogerheide, Loyens, & van Gog, 2016; Wilson, 2013) but they did conclude that ethnicity could possibly be an important factor that affects the learning outcomes of students. Surprisingly, no research has been done yet about the ethnicity of the instructor and how this affects the way students perceive their instructor and moreover what implications this might have on the learning outcomes of students.

However, some research has been conducted on the MOS hypothesis in terms of ethnicity where they used slightly different approaches. These studies used animated instructors instead of real instructors and used the similarity attraction hypothesis which is similar to the MOS hypothesis. In a study conducted by Isbister & Nass (2000) they used animated instructors (full motion video representation of an instructor) and real persons with the same ethnicity as the 40 male Korean students or a different ethnicity, the Korean male students (strong ethnic identity) were randomly assigned to an animated instructor with the same or different ethnicity or they were assigned to a real person in a different room with the same or different ethnicity. The students could choose between eight different choice-dilemma situations and used a microphone to interact with the animated instructor or real person and filled in a questionnaire about how they perceived the instructor's arguments/attractiveness and decision similarity. A significant similarity-attraction effect ($p <$

.05) was found for the Korean male students where they preferred to interact with a real person or animated agent who is more attractive or similarly attractive, moreover, the students were more willing to listen to them. Concluding, this finding could also count for the model-observer similarity hypothesis which means that the more ethnic similarities students perceive with the instructor, the more they will listen to them. In recent research with 80 university students from White American, Hispanic, African American and Asian ethnicities (Morena & Flowerday, 2006) it was investigated what the student's choice of the animated instructor would be based on their gender and ethnicity. The students had to identify their gender and ethnicity on a questionnaire, they could choose which of the 10 agents they preferred and followed a lesson of that agent about mechanics. The students could choose to see the agent or to only hear the audio of the agent and after the lesson the students filled in how they perceived the quality of the lesson and how motivating the agent was. They found that animated instructors who share the same race and gender with the students were more effective in learning for Non-Western (African Americans, Hispanics, Asians and Native American) students (Moreno & Flowerday, 2006). Thus, based on these findings ethnicity of instructors could possibly matter when it comes to learning from video modeling examples. Noteworthy, these findings have a different design than the design of the present study. These findings are relevant because current study can build up on these results.

Besides similarities in ethnicity, stereotyping could be another factor that possibly plays a role in the perceptions of students when they watch the instructor. When students focus on a teacher's ethnicity and not specifically on their behavior, a passive teacher effect could occur called "stereotyping" (Dee, 2005). Stereotyping could have effect on how the students perceive ethnic similarities or differences between themselves and the teacher (Dee, 2005).

In sum, the literature that is currently available is very scarce, findings are mixed, and relevant findings do not have the same research design as current study which makes it unclear if similarity in terms of ethnicity could play a role in learning from video modeling examples. Therefore, current study investigated when the video content is kept equal, the effectiveness of studying video modeling examples for student's self-efficacy and learning outcomes depends on whether the instructor is of similar ethnicity.

Current study

Current study aims to answer the research question: Learning from video examples: Does instructor ethnicity (Western,Non-Western) affect the test performance and self-efficacy of students from Vocational education? The students studied one video modeling example on how to convert fractions into decimal numbers. The instructors were both males and were not introduced as both having a different ethnicity. The purpose of current study is to test the MOS hypothesis based on the instructor's ethnicity by keeping the video content equal and making sure the explanations, and movements are identical, there will be one instructor per condition, also there will be a learning assignment (math assignment task about fractions).

The most interesting research question was whether students would perform better on the posttest and show more self-efficacy when they were more similar to the instructor in terms of ethnicity. Even though there is some evidence in the theoretical framework (e.g., Isbister & Nass, 2000; Morena & Flowerday, 2016) that ethnicity could have an effect on the test performance and self-efficacy of students it still remains an open question. Besides the fact that it remains an open question it was hypothesized that there will be a difference in pre and posttest scores between the two (Western, Non-Western) conditions (Hypothesis 1a).

Recent research on video modeling examples (De Koning, Hoogerheide, & Boucheix, 2018) consistently showed that video modeling examples are effective for student's learning and performance. Even though the evidence is limited, it was hypothesized that video modeling examples are effective for students in both conditions. Thus, it is expected that the test performance will be the highest for the post-test (Hypothesis 2a).

In current study mental effort was also investigated (after the pre and posttest), this gives more information about how efficient the instruction was and the mental effort it cost (Van Gog & Paas, 2008). It is expected that mental effort will be lowest at the posttest (Hypothesis 1b). It was also expected that student's self-efficacy will be higher at the posttest (Hypothesis 1c) because Bandura (1981) showed that novice students become more confident about themselves after they watched an instructor explain and demonstrate a learning task.

Self-efficacy was also measured before and after the students studied the video modeling example. It was hypothesized that there will be a difference in self-efficacy scores between the two conditions (Hypothesis 2b) because research consistently showed that learners obtain more confidence in their own abilities after the instructor successfully explained the task, especially when students perceive more similarities with the instructor (Bandura, 1997) Furthermore, it was also hypothesized that there will be a difference in mental effort scores between the two conditions (Hypothesis 2c). Research showed that mental effort decreases when students become more confident about themselves and when they perceive more similarities with the instructor.

In previous studies (e.g., Isbister & Nass, 2000; Morena & Flowerday, 2016) it was demonstrated that students performed better when they received instruction from someone with the same ethnicity, consequently it was hypothesized that students who watched video modeling examples of an instructor with the same ethnicity will score better on the posttest

than the students who watched the video of an instructor with a different ethnicity (Hypothesis 2d).

How much a student enjoyed learning was also investigated because in previous studies this seemed to have an effect on how well the students will listen (Kim et al., 2003; Liew et al., 2013). It is expected that the students enjoy learning more when they are listening to an instructor of their own ethnicity (Hypothesis 3a) because students had more benefits by listening to their own ethnicity in previous studies (e.g., Isbister & Nass, 2000; Morena & Flowerday, 2016). Lastly, the students also evaluated what they thought of the quality of the explanations given by the models, this was also done in a study by Hoogerheide and van Wermeskerken (2016) which turned out to be a very relevant factor. It is therefore expected that the scores of quality of the instruction will vary between the two conditions (Hypothesis 3b).

Method

Participants and design

Prior to conducting the experiment, a statistical power analysis was executed by using G*Power3 (Faul, Erdfelder, Lang, & Buchner, 2007) to investigate how many participants were required to detect some level of effect and a high power. A moderate effect size of (*d*= .50) was used to calculate the statistical power. The results showed that (*n* =198) participants with two groups of equal sizes (*n* = 99) are required to achieve a power of .95 and an alpha of .05.

The experiment had a 1 × 1 design, with Ethnicity instructor (Western, Non-Western) as between-subject factor. Participants were 36 predominantly Non-Western Dutch vocational education students (*M* age = 20.22, *SD* = 3.01; 17 males, 19 females) in their second year of vocational education. Vocational education is the third-highest level of higher

education in the Netherlands with a duration of 2-3 years. The schools were located in middle class and lower-class neighborhoods in Utrecht and Harlem. The experiment consisted of 4 phases: pretest, video modeling examples, posttest and background questions. Participants were quasi-randomly assigned to the Western Condition (WC; $n = 17$) or Non-Western condition (NC; $n = 19$). The topic of the video modeling example was not yet taught during this time of the year.

Materials

The materials which were used during the experiment were presented by using Qualtrics (http://www.qualtrics.com).

Video modeling example

In total two video modeling examples were created one with a Western instructor and one with a Non-Western instructor, both males who explained how to convert fractions into decimal numbers, percentages and fractions. This topic was chosen because the first- and second-year students from vocational education needed more elaboration on this topic. But also, because mathematic uses concrete steps to calculate or convert math problems which was very suitable for video modeling examples where an instructor explained how to solve a learning task step by step. The same explanation and examples were given by both models. The Western instructor had an age of $M = 24$ and the Non-Western instructor had an age of $M = 21$ and they both wore a grey outfit and were standing while explaining in a room with the learning materials used during math class. To guarantee that the models gave similar explanations and used the same amount of time explaining the steps an autocue was used. The video modeling examples were practiced before the final, official video modeling examples were created. During the explanations given by the instructors, they also interacted with the learning materials, so the steps were clearer for the students. The instruction was

done in a step by step idea and each step was modeled by the instructor. This was done in chronological steps and each step was also modeled by the instructor. “First of all, you define the fraction, a fraction is a part of a whole “. The instructors gave instruction about how the students can convert fractions into a decimal number, percentage, and lastly a proportion.” “Step one is converting the fractions into money (coins/cent)”. “Step three is converting the (coins/cent) by dividing this with hundred”.

Fig. 1. Western instructor (left) and Non-Western instructor (right).

Pretest and posttest (fractions level 2F)

One pretest and one posttest were created in collaboration with a mathematical teacher from ROC MN (vocational education school) with twenty years of experience. The pre and posttest were based on old exams from 2019-2020 vocational education level 2F mathematics. The reliability of the pre and posttest were checked before they were used for the experiment, the results showed an acceptable reliability ($\alpha = .52$). The pre and posttest represented the material which was explained during the video modeling examples and consisted of ten questions about fractions. The ten questions were all based on fraction problems from level 2F and not embedded with a story, the questions were asked without any

context because a lot of students were not fluent Dutch speakers (e.g., write 2/10 as a percentage).

The pre and posttest were parallel to each other, meaning that the content is similar but placed in a different order. In the pretest (e.g. write 12/5% as a percentage) the questions about fractions were asked in the same order as explained in the video modeling examples and, in the posttest (e.g., write 4/32 as a decimal number and as a percentage) the questions were asked in the opposite order and contained two events instead of one event. The exercises in the posttest measured near transfer in participants, they were asked to apply what they had learned to more complex tasks with two events which were different in structural features (e.g., write 25% as a decimal number and as a fraction). In both tests, questions were asked about decimal numbers, percentages, and fractions. Questions like "Write 8/40 as a percentage = 1/5 and as a decimal number = 0.2 ". All ten exercises required participants to fill in the correct answer without filling in the calculation.

Mental effort

When students finished making the pretest they were asked to indicate how much mental effort they invested in answering the questions. Mental effort was also measured after the students finished the posttest; students filled in the 9-point rating scale of Paas (1992). The rating scale showed on a 9-point scale how much effort the students invested in watching the video modeling examples from (1) very low effort to (9) very high effort. Paas and van Merriënboer (1994) found a Cronbach's alpha of .90 for this rating scale which is very reliable.

Self-efficacy

Before and after the students watched the video modeling examples they were asked to fill in a questionnaire of a 9- point scale in which they had to rate how confident they were

about mastering the new skill from (1) very unconfident to (9) very confident. This questionnaire was based on the questionnaire from Hoogerheide et al., (2014) and the formulation of the questions in the questionnaire are highly similar to Bandura (2006).

Quality of instruction

The students were asked to rate the quality of the video modeling examples after they watched the videos on a scale from (1) very, very bad quality to (9) very, very good quality. This questionnaire was based on the questionnaire from Hoogerheide et al., (2014).

Learning enjoyment

Based on the questionnaire from Hoogerheide et al., (2014) the students were also asked to give a grade which indicated how much they liked and enjoyed the video modeling examples on a scale from 0 (lowest) to 10 (highest).

Background from the students

At the end of the experiment; when students watched the video modeling examples and finished the pre and posttest they were asked to fill in a questionnaire. This questionnaire contained questions about their experience with other ethnicities. Questions such as “Do you have family members from other ethnicities than your own”? “Do you have friends from other ethnicities”? ” Do you have teachers from other ethnicities”? “Did you ever have a Western teacher”? “Did you ever have a Non-Western teacher “? “Do you have a preference for a Western instructor when learning mathematics”?

Procedure

The participants were voluntarily able to choose if they wanted to participate in the experiment and also received an informed consent in their email before they started with the experiment. The informed consent mentioned the goal of the experiment, what was asked of

the participants and what would happen during the experiment, it also contained ethical aspects such as the reliability and that information was privately and ethically processed. The students were randomly assigned to a Western or Non-Western instructor by equally dividing the students between the two instructors. The students were not aware that there were two instructors and what the ethnicity of the instructor was. The experiment took 15 minutes and took place on a digital device (e.g., phone, laptop). The Qualtrics questionnaire consisted of 6 parts. Part 1 presented the informed consent and part 2 contained some general questions about the participants (e.g., age, ethnicity), part 3 presented the pretest questions which had no time limit where at the end of the pretest they filled in the mental effort scale and self-efficacy scale. Part 4 provided the video modeling examples, the videos were followed by a mental effort scale, self-efficacy scale, quality instruction scale and learning enjoyment scale. Furthermore, part 5 presented the posttest, there was no time limit and the posttest were followed by a mental effort scale and self-efficacy scale. Finally, part 6 consisted of questions about ethnicity (e.g., did you ever have a teacher with a different ethnicity).

Data Analysis

The test performance was scored by using coding schemes and a coding protocol was developed by the author and a mathematics teacher based on the vocational education exams from 2019-2020 mathematics 2F which was developed by the College for Tests and Examinations (College voor Toetsen en Examens). Maximally 10 points could be earned on the pre and posttest for the mathematical problems that measured learning. Each mathematical question required two answers. Participants could get one point per correct answer (one point for one correct answer, half a point for a partially correct answer, zero for an incorrect answer) and two points if both answers were correct. Both points were granted if

participants wrote down the 2 correct answers. A pilot study was conducted by the two assessors (author and mathematics teacher) before checking the test, this ensured that the pre and posttest are scored equally by both assessors which results in a good interrater reliability. The two assessors had a score of $k = .850$ for the inter-rater reliability, this was interpreted as a high agreement by Landis and Koch (1977). The inter-rater reliability had a high score, consequently the two assessors checked the real tests of the students, which was used for the analysis. Furthermore, averages for mental effort were calculated after the pre and posttest, averages for self-efficacy were calculated after the pretest and after the video modeling examples, and quality of instruction after the video modeling examples, and lastly learning enjoyment also after the video modeling examples. Lastly, ethnicity of the students was calculated by using the ethnicity they filled in for "group identity" students were able to choose themselves if they felt like a Western or Non-Western person.

Coronavirus

Unfortunately, we were tormented with the Coronavirus, this virus changed the whole world. New measures and rules had to be obeyed in order to keep the virus under control. The new measures and rules meant that we could have no physical contact with students and teachers. The four instructors I had in mind were math teachers with more than ten years of experience, the teachers were so busy with this new situation and Corona that they could not record the instruction video. So, I had to ask a Non-Western relative and a Western friend with no mathematical expertise to record the video modeling examples. Because they were also busy, we were not able to practice the math instruction, therefore the instructions are not a hundred percent similar to each other. Consequently, one of the instructors talked faster than the other, so the amount of time from the videos were not similar.

Furthermore, the questionnaire was sent to the students by email instead of handing the

questionnaire to them in a classroom. Consequently, many students did not open their mail or did not feel motivated to fill in the questionnaire digitally. As a result, I had very few responses from students, not enough response to take conclusions from my data.

Results

Unless otherwise indicated, the results were analyzed with a repeated measures ANOVA, with test moment as within-subject factor (Pretest, Posttest) and condition as between-subject factor (Western, Non-Western). Assumptions for the repeated measures ANOVA were checked, only the violated assumptions will be mentioned in this section if an assumption was violated. The experiment had $n = 36$ participants which was not equally divided, 17 participants in the Western condition and 19 participants in the Non-Western condition, thus, the interpretation of the data must be done with caution. The means and standard deviations of test performance, mental effort, self-efficacy, learning enjoyment and quality of instruction can be found in Table 1.

Table 1.

Means (SD) of pre and post-test scores (range 0-10), mental effort (range 1-9), self-efficacy (range 1-9), learning enjoyment (range 1-9) and quality of instruction (range 1-9) per condition.

	Western Instructor	Non-Western Instructor
Variables	M (SD)	M (SD)
Pretest performance	5.35 (1.80)	4.95 (3.13)
Posttest performance	6.35 (1.50)	6.00 (2.56)
Self-efficacy pretest	5.24 (2.22)	5.47 (.96)
Self-efficacy posttest	6.12 (1.62)	5.74 (.93)
Mental effort pretest	5.24 (2.22)	5.47 (.96)
Mental effort posttest	6.12 (1.62)	5.74 (.93)
Quality of instruction	6.35 (1.17)	5.58 (1,17)
Learning enjoyment	5.35 (1.17)	5.32 (1.34)

Test performance

The assumption of normality of residuals by time point was violated, the histogram was not normally distributed. Because this was the only violation, the repeated measures ANOVA was still conducted. Hypothesis 1a and hypothesis 2a were checked by using a repeated measures ANOVA, with Test Moment (Pretest, Posttest) as within-subject factor and Ethnicity Instructor (Western, Non-Western) as between-subject factor. The scores from the pre and posttest which measured the learning performance showed a main significant effect of Test Moment, $F(1, 34) = 12.91$, $p < .001$, $\eta_p^2 = .27$. Students scored significantly higher on the Posttest ($M = 6.25$, $SD = 2.12$) than on the Pretest ($M = 5.14$, $SD = 2.56$), hypothesis 1a is accepted. There was no main significant effect of Ethnicity Instructor, $F(1, 34) = 0.412$, $p = .526$, $\eta_p^2 = .012$ and no significant interaction effect between Test Moment and Ethnicity Instructor $F(1, 34) = 0.041$, $p = .834$, $\eta_p^2 = .001$ hypothesis 2a is therefore rejected.

Mental effort

In order to test Hypothesis 1b and hypothesis 2c two t-tests were conducted. An independent samples t-test is used to test hypothesis 2c with Ethnicity Instructor (Western, Non-Western) as grouping variable and Mental Effort as test variable. The students gave a higher score for mental effort they invested in the pretest when they watched the Western instructor ($M = 5.06$, $SD = 1.71$) and a lower mental effort score for the pretest when they watched the Non-Western instructor ($M = 4.53$, $SD = 1.54$) however, this was not significant ($p = .529$, $df = 34$). There was a significant difference between the two conditions for the mental effort students invested in the posttest ($p = .005$, $df = 34$). Students gave a higher mental effort score ($M = 4.94$, $SD = 1.85$) for the Western instructor and a lower mental effort score for the Non-Western instructor ($M = 4.63$, $SD = .89$). Furthermore, a t-test to compare

means between pretest and posttest scores for mental effort was conducted to test hypothesis 1b. The results showed that means for mental effort were equal for both pre (M = 4.78, SD = 1.62) and posttest (M = 4.78, SD = 1.41). Mental effort was not the lowest at the posttest, therefore hypothesis 1b was rejected.

Self-efficacy

The assumption of normality of residuals by time point was violated, the histogram was left skewed. Because this was the only violation, the repeated measures ANOVA was conducted. A repeated measures ANOVA was used with Test Moment (Pretest, Posttest) as within-subject factor Ethnicity Instructor (Western, Non-Western) as between-subject factor to test Hypothesis 1c and hypothesis 2b. A significant main effect of Test Moment, F (1, 34) = 11.97, $p < .001$, $\eta_p^2 = .26$ was found. Students had more self-efficacy in their mathematical abilities on the posttest (M = 5.92, SD = 1.30) than on the pretest (M = 5.36, SD = 1.66), hypothesis 1c is accepted. There were no significant different scores for self-efficacy in the two conditions F (1, 34) = .02, p = .881, $\eta_p^2 = .001$ hypothesis 2b is rejected. Furthermore, there was no significant interaction effect between Ethnicity Instructor and Test Moment, F (3, 34) = 3.50, p = .070, $\eta_p^2 = .093$.

Learning enjoyment

An independent samples t-test was used to test hypothesis 3a with Ethnicity Instructor (Western, Non-Western) as grouping variable and Learning Enjoyment as test variable. Based on the scores of learning enjoyment student enjoyed watching the Western instructor slightly more (M = 5.35, SD = 1.17) than the Non-Western instructor (M = 5.32, SD = 1.34) but this was not statistically significant (p = .930, df = 34). There were no significant differences between the two conditions in learning enjoyment scores, hypothesis 3a is rejected, ethnicity of the instructor has no significant effect on how the students will rate the

learning enjoyment.

Quality of instruction

Hypothesis 3b was tested by using an independent samples t-test with Ethnicity Instructor (Western, Non-Western) as grouping variable and Quality of Instruction as test variable. Based on the scores of quality of the instruction it was noteworthy that the students who watched the Western instructor gave a higher score for the quality of instruction (M = 6.35, SD = 1.17) than the students who watched the Non-Western instructor (M = 5.58, SD = 1.17), this was significant (p = .050, F = .235, df = 34). The scores for quality of the instruction were significantly different in the two conditions, hypothesis 3b is accepted.

Ethnicity of students

Furthermore, it was explored if there was a relationship between ethnicity instructor and ethnicity student. Because there were not enough participants this could not be statistically tested, therefore this was exploratively checked by using the information about the ethnicity of the students, the ethnicity of the instructor and the test performance scores. The test performance means of the students in the different conditions (Western, Non-Western) were compared with each other to investigate if there was evidence for the model-observer similarity effect; students preferred an instructor with the same ethnicity as themselves. The result can be found in Table 2. The results from Table 2 showed that the conditions where instructor and student shared the same ethnicity scored better in several variables (pretest, mental effort, learning enjoyment, quality of instruction) than the conditions where the instructor and student had a different ethnicity. Especially the condition where there is a Western instructor and a Western student scored higher than the other conditions. Thus, some evidence was found for the relationship between ethnicity of the instructor and ethnicity of students.

Table 2.

Means (SD) of pre and post-test scores (range 0-10), mental effort (range 1-9), self-efficacy (range 1-9), learning enjoyment (range 1-9) and quality of instruction (range 1-9) per condition with the ethnicity of student.

	Condition							
	Western Instructor Western Student		Western Instructor Non-Western Student		Non-Western Instructor Non-Western Student		Non-Western Instructor Western Student	
Variables	M	(SD)	M	(SD)	M	(SD)	M	(SD)
Pretest performance	5.60	1.78	5.00	1.91	5.00	3.12	4.33	2.96
Posttest performance	6.50	1.79	6.57	1.13	6.44	2.79	5.11	1.97
Self-efficacy pretest	4.90	2.56	5.11	.33	5.67	1.23	5.71	1.70
Self-efficacy posttest	6.10	1.80	5.56	.88	5.78	.97	6.14	1.46
Mental effort pretest	5.10	1.45	5.33	.55	4.00	1.83	5.00	2.16
Mental effort posttest	4.70	1.52	5.00	2.38	4.78	.67	4.78	.67
Quality of instruction	6.70	.83	5.86	1.46	6.00	1.00	5.44	1.01
Learning enjoyment	5.70	.82	4.86	1.46	5.56	.88	5.44	1.33

Background questions

Lastly, the background questions were analyzed per condition (Western, Non-Western) and can be found in Table 3. The results showed that most students had family, friends and teachers with another ethnicity than themselves. Almost all the students had a Western and Non-Western teacher in their schooltime. Twenty three students claimed that they did not have a preference for a teacher with a specific ethnicity while eleven students claimed that they preferred a Non-Western teacher. Most of the students claimed that ethnicity of a teacher mattered when a teacher explained mathematics to them.

Table 3.

Number of students (n) and response (R) per question.

	Condition			
	Western Instructor Western Student	Western Instructor Non-Western Student	Non-Western Instructor Non-Western Student	Non-Western Instructor Western Student
Background Questions	n 'R'	n 'R'	n 'R'	n 'R'
Family with another ethnicity than yourself?	10 'Yes'	7 'Yes'	5 'Yes' 4 'No'	2 'Yes' 8 'No'
Friends with another ethnicity than yourself?	10 'Yes'	6 'Yes' 1 'No'	8 'Yes' 1 'No'	2 'Yes' 8 'No'
Teacher with another ethnicity than yourself?	10 'Yes'	6 'Yes' 1 'No'	8 'Yes' 1 'No'	10 'Yes'
Did you ever have a Western teacher?	10 'Yes'	6 'Yes' 1 'No'	9 'Yes'	10 'Yes'
Did you ever have a Non-Western teacher?	7 'Yes' 3 'No'	6 'Yes' 1 'No'	9 'Yes'	9 'Yes' 1 'No'
Do you have a preference for a teacher with a specific ethnicity?	2 'W' 8 'DNM'	7 'DNM'	6 'NW' 3 'DNM'	5 'NW' 5 'DNM'
Do you believe that ethnicity matters if a teacher needs to explain mathematics to you?	2 'Yes' 8 'No'	4 'Yes' 3 'No'	7 'Yes' 2 'No'	7 'Yes' 3 'No'

Discussion

Current study investigated if ethnicity of the instructor (Western, Non-Western) has an effect on the student's self-efficacy and what they have learned from video modeling examples, in which it was demonstrated how fraction problems are solved. Current findings demonstrate that test performance and self-efficacy improve from pretest to posttest, which reaffirms that studying video examples is beneficial for the learning and learning gains of students (De Koning, Hoogerheide, & Boucheix, 2018; Hoogerheide et al., 2018; van Wermeskerken et al., 2018).

However, the extent to which test performance and self-efficacy improve from pretest to posttest did not depend on whether the instructor was Western or Non-Western. Furthermore, there is no significant effect of ethnicity on mental effort, the performance of the students, self-efficacy and learning enjoyment. The ethnicity of the instructor only has influence on the perceived quality of the instruction because the instructors both have a

different accent (Dutch accent, foreign accent), this could have influenced how much the students like listening to this accent which in turn influenced the students perceived quality of instruction.

The studies of (e.g., Baylor & Kim, 2003; Isbister & Nass, 2000; Morena & Flowerday, 2016) showed that animated agents with different ethnicities had influence on the learning of students, current study on the contrary did not find this effect. This could be caused by the fact that the students did not understand the term "Western" and "Non-Western" and could not distinguish these from one another. Furthermore, it could be possible that they did not know which characteristics, accent, physical appearances fit with a Western or Non-Western person. Consequently, they have no idea which instructor is Western or Non-Western and possibly also have trouble knowing for themselves if they are Western or Non-Western. Labeling someone's ethnicity as Western or Non-Western is very broad in comparison with labeling someone as Dutch or African, in the study of Baylor, Shen, and Huang (2003) they used the label African-American and White-American and in the study of Moreno and Person (2002) they used African-American and Caucasian. Future research should use these labels or other labels which do not group so many ethnicities below one label. Furthermore, the animated agents used in previous studies (Prat et al., 2007; Baylor, Shen, & Huang, 2003) looked exactly like the stereotype of a person with that specific ethnicity. The instructors of current study did not typically look like a stereotype Western or Non-Western person, their physical appearances were similar (both light colored eyes, dirty blond hair, light skin, thin lips). If the instructors looked more like a typical Western or Non-Western person, the students could have possibly distinguished better and would have seen more characteristics and physical appearances they have in common. Therefore, according to the MOS hypothesis (Johnson & Lammers, 2012) the students would

have perceived themselves more similar to the instructor and their learning and self-efficacy would be more affected by the instructor.

Because video examples lead to more learning gains for students it was expected that mental effort would decrease after they watched the instructor explaining the fraction problems (Hoogerheide, Loyens, & van Gog, 2015). Current study shows that mental effort did not significantly decrease from pretest to posttest (Hypothesis 1b), furthermore there are no significant differences in mental effort between the Western and Non-Western condition (Hypothesis 2c). Hoffman and Schraw (2010) mentioned that mental effort gives information about the quality of the instruction and skills to be learned. It could imply that the fraction problems demand too much cognitive load from the students which results in no significant lower levels of mental effort, this implication corroborates with the study from Paas (1992).

As explained by Bandura (1981) and Zimmerman (2000) self-efficacy is a variable that could also cause improve learning outcomes because students obtain more confidence after watching a good explanation by an instructor. In corroboration with these studies, self-efficacy significantly increases from pretest to posttest (hypothesis 1c), however no effect of instructor's ethnicity is found (hypothesis 2c). The students did become more confident of themselves after watching the video example but the ethnicity of the instructor did not have a significant effect on the increased self-efficacy. This may be caused because the students did not observe similarities with the instructor's appearance and behavior, consequently the perceived self-efficacy of the students is not much influenced by the instructor's behavior and there was no produced effect (Bandura, 1994). A possible reason that the students did not perceive similarities could be because the manipulation was too broad (Western, Non-Western) and the instructors did not show stereotyping behavior, consequently it is harder for students to identify themselves with the instructor. In previous

studies (e.g., Moreno & Person, 2002; Prat et al., 2007) they used a smaller manipulation (African, Caucasian) with animated agents who have stereotyping appearances and behavior which made it easier for the students to identify themselves with an instructor.

Hoogerheide and van Wermeskerken (2016) pointed out in their study that quality of instruction is an important factor when it comes to video examples. Current findings showed that the ethnicity of the instructor has influence on the scores students give for the quality of instruction. This could suggest that the accent of the instructors were different in both conditions (Western, Non-Western) which leads to students who recognize a certain accent and favour or unfavour this accent. The Western instructor had a very Dutch accent and the Non-Western instructor had a South American accent. The students gave higher scores for the Western instructor with a Dutch accent, possibly his accent and voice were more pleasant. It would be interesting for future research to keep the accents of the instructors equal in both conditions and investigate if there would still be an effect of instructor's ethnicity. Learning enjoyment also has an effect on how well the students will listen (Kim et al., 2003; Liew et al., 2013) the more they enjoyed the better they listened to the instructor. There was no significant effect for instructor's ethnicity on learning enjoyment of students (hypothesis 3a), thus the ethnicity of the instructor does not need to be taken into account.

Ethnicity of the student is exploratively investigated and the results show that students have higher scores in several variables (pretest, mental effort, learning enjoyment, quality of instruction) in the conditions where they share the same ethnicity as their instructor. This indicates that students possibly listen better and perform better when they have an instructor with the same ethnicity as themselves. This implication corroborates with the findings from (e.g., Isbister & Nass, 2000; Morena & Flowerday, 2016) where they also found that students perform better when they have an instructor with the same ethnicity. However, because this is

exploratively investigated the results need to be interpreted with caution and future research should conduct more investigation with a bigger sample.

One limitation of this study is the manipulation of ethnicity, which was not very subtle and too broad, all the different ethnicities were grouped in Western or Non-Western which was not specific and small enough. Consequently, many different ethnicities were grouped below the label Western or Non-Western. Future research should select two groups (e.g., Dutch and Moroccan) and randomly assign these to a (e.g., Dutch or Moroccan) instructor, this way the manipulation is smaller and there will be a higher chance that students will perceive themselves similar to the instructor. Another potential limitation of the study is the duration of the video modeling examples, they did not have the same duration. This could have affected the results of the study. Future research should keep the duration of the video modeling examples equal. The last limitation of this study is the sample size (n = 36) which was too small to find a significant effect and sufficient power according to the priori power analysis. If a larger sample of maximum (n = 198) participants was used, other effects might have occured. Therefore, future research should replicate this study with a bigger sample to investigate if ethnicity of the instructor is significant.

In conclusion, current findings support the knowledge about video modeling examples and whether the characteristics of the instructor affects how much students gain from watching video modeling examples. In recent research (Hoogerheide, van Wermeskerken, van Nassau, & van Gog, 2018) the importance of video modeling examples are mentioned, how beneficial it is for the learning of students and also the popularity and use in different settings (formal and informal). Video modeling examples are beneficial for the learning of students and should be used more in learning settings to improve the performance of students.

However, it does not seem that the instructor's ethnicity is a crucial factor to consider when making video modeling examples, even though an assignment looks more appropriate for a specific ethnicity (e.g., Dutch), this only counts for Vocational Education students who are learning cognitive skills. It would be interesting if future research could investigate if different results would arise with older or younger students and a smaller manipulation.

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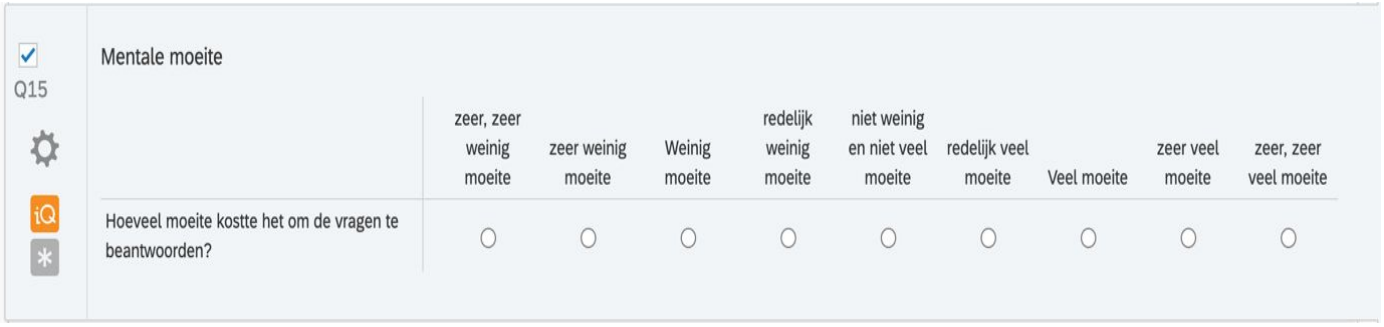
Appendix A

Mental Effort

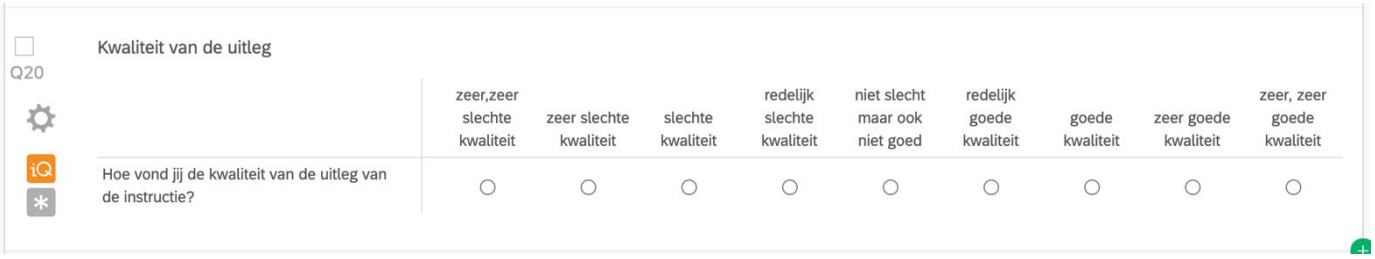


Appendix B

Self-efficacy

Appendix C

Quality of instruction



Appendix D

Learning enjoyment

Q21

Leerplezier

	helemaal, helemaal niet leuk	helemaal niet leuk	niet leuk	redelijk niet leuk	niet leuk maar ook niet vervelend	redelijk leuk	leuk	heel erg leuk	heel, heel erg leuk
Hoe leuk was het bestuderen van de instructievideo voor jou?	○	○	○	○	○	○	○	○	○