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How to measure the human value awareness of design students?

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ABSTRACT

We designed Value Awareness Measurement (VAM) to know how much design students know about human values and how they estimate their awareness of this concept. VAM is a questionnaire with four scales: Scale-1: participants' self-report about being aware of human values, Scale-2: participants' general knowledge about human values, Scale-3: participants' value awareness, and Scale-4: participants' opinions about the importance of human value awareness in everyday life. To test VAM, we used this questionnaire before and after an introductory workshop about human values with HuValue tool. The results showed a significant effect of the workshop on three out of four scales, which means our questionnaire can measure human value awareness.

Introduction

The ethical qualities of the design process and designed artifacts have increasingly drawn attention in recent decades (e.g. Nissenbaum and Walker 1998; Mehalik and Gorman 2006; Coeckelbergh 2006; Swierstra and Jelsma 2006; Shilton 2012; Steen 2015; JafariNaimi 2018; Kudina and Verbeek 2018; Brey 2018; Voinea 2018; Nelson and Gorichanaz 2019). In this respect, human value is a fundamental concept. According to Rokeach (1973, p. 5), value is "an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence." Human values guide human actions and behavior in daily situations and express basic human needs. Values have a vital motivational component because they refer to desirable goals. Values

serve as standards and criteria, and value systems are general plans employed to resolve conflicts and make decisions. Indeed, the employment of values as standards is a fundamental difference between human and non-human (Rokeach 1973, pp. 3–25). Several instruments such as Types of Men by Spranger (Hague 1968), Scale of the Allport-Vernon-Lindzey (Hunt 1968), Rokeach (1973) Value Survey, Value Orientation Method by Kluckhohn (Gallagher 2001), Values Survey Module by Hofstede (Hofstede, Hofstede, and Minkov 2010), World Values Survey by Inglehart (2000), the Portrait Value Questionnaire by Schwartz (2012), Values in Action Inventory of Strengths by Peterson and Seligman (2004), are designed as predictors of value relevant attitudes and behavior.

The importance of human values in technology and design education is well established, (e.g. Barlex 1993; Breckon 1998; Coles and Norman 2005; Conway 1994; Conway and Riggs 1994; Dakers 2005; de Vries 2005; Elshof 2005; Holdsworth and Conway 2009; Järvinen and Rasinen 2015; Layton 1991; Martin 2002; McLaren 1997; Middleton 2005; Pavlova 2009; Prime 1993; Rekus 1991; Tungaraza and Sutherland 2005). However, less attention has been given to developing educational materials for the role values play in design (Eriksson et al. 2022). By considering students as future citizens with influential professions, these studies noted the responsibility of teachers to raise their awareness about different types of values in life (Conway 1994). Pavlova (2009) has already emphasized the role of values for decision-making, value judgments, and evaluation in design as a complex intellectual activity (see also (Rauterberg 2017)). Although Berkowitz (2011) describes value awareness in education, he concentrates mainly on character development, while we are interested in the change process of value awareness of individual design students.

Meynhardt and Fröhlich (2019) focus on value awareness and define this as a cognitive competence that helps recognize how and for whom value is genuinely created (Meynhardt and Fröhlich 2019). Further, Fröhlich (2019) investigated and started to measure *value awareness*. "Formal definiert beschreibt Wertbewusstsein die Fähigkeit, eine bestimmte Wertkategorie aus der Public Value Matrix in Bewertungsprozessen als (potentiell) relevant zu erkennen [*translated into English by authors*: a formal definition describes value awareness as the ability to recognize certain value categories from the Public Value Matrix in evaluation processes as (potentially) relevant" (Fröhlich 2019, pp. 123–124). While Fröhlich seems to aim for a *trait* measure, we are looking for a sensitive *state* measure of value awareness (Hintz, Geiser, and Shiffman 2019).

Considering the importance of knowledge about human values in design education, besides the insufficient hands-on learning/teaching activities, we noticed the need for a state measure instrument to measure the influence and succession of this kind of learning/teaching activities. So, we executed

an introductory workshop about human values with our HuValue tool for teaching primary knowledge about human values (Kheirandish 2018). HuValue is a design tool based on our most comprehensive value framework (Kheirandish et al. 2020b). Generally, the HuValue tool is a means of facilitating thinking about and discussing human values. Furthermore, this tool supports designers with simple but familiar materials during their design process to analyze everything (object/subject/situation) from a wide value point of view (Kheirandish et al. 2020b). More details about the tool and its components can be found in Kheirandish and Rauterberg (2018) and (Kheirandish et al. (2019) and (Kheirandish and Rauterberg 2020). To investigate whether this workshop as a teaching activity can raise students' awareness about human values or not, we developed our Value Awareness Measurement (VAM) as a questionnaire with four scales and a combination of subjective and objective approaches (see the questionnaire in the Appendix). Each scale addressed one of the following four sub-questions.

Overall research question: Is a workshop with the HuValue tool capable of raising awareness about human values?

1. Whether participants' self-reports about being aware of human values would change from before to after the workshop?
2. Would participants' general knowledge of human values change from before to after the workshop?
3. Whether participants' value awareness would change from before to after the workshop?
4. Would participants' opinions about the importance of human value awareness in everyday situations change from before to after the workshop?

Methodology

Participants

Forty-eight first-year design students (12 project groups) were randomly selected and invited to participate in a workshop (ws) about human values. 42 out of 48 invited students were present in the workshop and answered the VAM questionnaire just before starting (pre-ws). The test was repeated a week after (post-ws) with the same participants, in which all participants, except two, did the questionnaire again. Consequently, those two pre-ws participants' data were excluded from further analysis. According to the collected data, 67.5% of participants were female, and 32.5% were male. Eighty percent of the participants were Dutch, and their mean age was 19.07 (SD = 1.33), varying from 17 to 24, of whom 85% had heard about human values before.

Design

To answer the research question, we planned a workshop to introduce the HuValue tool and allow them to use it *via* some playful activities. In addition, the questionnaire VAM was developed to measure students' awareness of human values before (pre) and after (post) the workshop (ws) (McCoach, Gable, and Madura 2013). The questionnaire was distributed among participants twice.

Procedure

Dependent variables (DV) in this study were (DV1) *self-report-statements* for the first scale, (DV2) *test-statements* for the second scale, (DV3) *words* for the third scale, and (DV4) *everyday-life's-situations* for the fourth scale. *Independent variables* (IV) in this survey were specified as (IV1) *pre/post-workshop* for all scales, (IV2) *correct/incorrect* for the second scale, and (IV3) *value/non-value and Groups of words* for the third scale.

First scale (DV1): self-report-statements

The first scale of the questionnaire contained five statements about participants' attitudes toward learning and thinking about human values. Students were supposed to pinpoint how much they agree or disagree with each statement on a five-point Likert-type scale, "strongly disagree" (-2), "disagree" (-1), "neutral" (0), "agree" (1) and "strongly agree" (2).

Second scale (DV2): test-statements and correct/incorrect

The second scale of the questionnaire included nine correct/incorrect test-statements in general knowledge about the nature of human values. Five were correct, and four were incorrect statements. The five-point rating scale was applied to rank the agreement with each statement's correctness, from "strongly disagree" to "strongly agree."

Third scale (DV3): words, value/non-value, and groups of words

The third scale of the questionnaire was a question about value awareness, in which participants were supposed to distinguish human values from non-values. In this section, 40 words, a mixture of human values and non-values (*words*), were given multiple options, and participants were asked to tick mark human values. The words were presented as a mixture and without any labels. However, for the data analysis, we clustered them, as 24 of those words were human values, and 16 of them were not human values (*value/non-value*). The human values included 16 key values from HuValue tool (eight "simple-values" and eight "complex-values") and eight "extra-values"

from the existing lists of values. The non-values included eight "complex-words," which looked like values, and eight "simple-words" (*Groups of words*).

Fourth scale (DV4): everyday-life's-situations

The fourth scale of the questionnaire was a question about the importance of human values in everyday-life's-situations, with eight given situations. The importance of each situation had to be ranked on a five-point Likert-type scale, "Not important at all" (−2), "Not very important" (−1), "Neutral" (0), "Important" (1) and "Very important" (2).

All scales (IV1): pre/post-workshop

VAM was conducted twice, before (pre-ws) and after (post-ws) the workshop, to compare the results and study the capability of our workshop for raising awareness about human values.

In this study, to reduce systematic errors, we fixed the location so that the pre-test measures, the workshop, and also the post-test measures were conducted in the same lecture room. To increase the reliability of the VAM questionnaire, instead of a yes/no scale, we used a five-point Likert-type scale with balanced keying (an equal number of positive and negative statements) and a clear label for each step (Preston and Colman 2000). An anonymous questionnaire with an arbitrary student number rather than a name was used to reduce social pressure and desirability bias. In addition, regarding the internal consistency of the VAM questionnaire, a reliability analysis was carried out on the perceived task values scale comprising 30 questions. Cronbach's alpha indicated the questionnaire reached acceptable reliability, $\alpha = 0.702$ (Taber 2017). Also, the significant difference in pre-test and post-test ($F(1, 34) = 21.189$, $p \leq 0.001$) can demonstrate good construct validity of the questionnaire (Dimitrov and Rumrill 2003). Considering the replicability of this study, a full version of the VAM questionnaire is available in the Appendix. The following is the procedure for conducting our workshop: The workshop contained six phases: (1) a questionnaire, (2) a brief lecture, (3) a group activity, (4) a coffee break, (5) an individual activity, and (6) a discussion.

In the beginning, after introducing the workshop, we asked participants to fill in the VAM questionnaire (pre-ws). In continuation, we introduced human values briefly and simply with some examples. By mentioning some important points about human values from the second scale of the questionnaire, we stressed the significance of human values in design. Then we introduced the tool and its components in short.

Afterward, we asked them to play a group game with the tool in their project groups (See the description in the Appendix). The main points of the group activity were to give the students a chance to review different parts

of the tool and to get familiar with the details; nine groups of values, value words, picture cards, and so forth. In addition, they were supposed to discuss value words and groups of values and their connections with the picture cards as examples in their groups. This activity motivated them to go over the words, groups, and examples, understand them and link them together. It also raised participants' awareness about their different and similar opinions and gave them a chance to know there are various views on the same topics. The activity had two parts: (1) Group discussion and (2) Group game. The purpose of the first part was to warm up, in which students were supposed to review a small number of picture cards (27 cards) and find their relevance to the values. In the second part, they had 180 picture cards (pre-shuffled and divided into four: 45 cards for each player) and were asked to do the same but in a more structured way. In each part, we explained to them what they should do, step by step, while a descriptive text with an expressive animation was showing on a slide.

Next, after a break, we gave each participant a toolkit and asked them to use it to make their value board (See the description in the Appendix). The primary purpose of this individual activity was to let them think deeply about themselves and explain and visualize their value system *via* the HuValue tool, which is supposed to help define their vision. They were gradually asked to find their essential values (value words) and their important activities (picture cards) and assign them to relevant groups of values. The activity had six steps. They had enough time to finish each step and start the next step together. In addition, for this activity, each student had enough space (a table) to make their own value-board, which was saved at the end as pictures to be printed later. To conclude the activities, by pointing to their values board as examples, we showed them how this visualization could help them to reflect on their value system and highlight their essential values.

In the end, we had time for discussion and asking questions. Furthermore, a week after the workshop, the participants received their posters of value boards and filled out the VAM questionnaire for the second time (post-ws). Some captured moments of main phases of the workshop including group activity and individual activity are presented in Figure 1.

Results

Besides demographic questions, the VAM questionnaire contained four main scales. In this part, we present the results of repeated measures ANOVA, which was conducted to compare the effect of the workshop on students' awareness of human values before and after the workshop. The results of each questionnaire scale are presented separately in tables and figures.

Figure 1. The Introduction workshop: Human values in Design. Top: Group activity: Play game. Bottom: Individual activity: Make your value-board.

Table 1. Results of the statistical analysis repeated measures ANOVA on scale one: Within-Subjects Contrasts of pre/post-workshop and self-report-statements.

Source	pre/post-workshop	Self-report-statements	df	F	Sig.
Pre/post-workshop	Linear		1, 39	2.931	.095
Self-report-statements		Linear	1, 39	18.175	.001*
		Quadratic	1, 39	16.781	.001*
		Cubic	1, 39	2.712	.108
		Order 4	1, 39	27.316	.001*
Pre/post-workshop* self-report-statements	Linear	Linear	1, 39	.374	.544
		Quadratic	1, 39	5.556	.024*
		Cubic	1, 39	14.993	.001*
		Order 4	1, 39	22.436	.001*

*Significant difference; $p < 0.05$.

The First Scale was a self-report about participants' awareness of human values. The results showed significant main effects of *self-report-statements* ($F(4, 156) = 13.903$, $p < 0.001$), and a significant interaction of *pre/post-workshop*

and *self-report-statements* (F(4, 156) = 9.198, $p < 0.001$)). The main effect of the pre/post-workshop in this test was not significant. From Table 1, we can see that there are linear, quadratic, and fourth-order significant contrasts between *self-reports statements*. In addition, the data suggested quadratic, cubic and fourth-order significant contrasts between *pre/post-workshop* and *self-report-statements*. These contrasts are visualized at the top and middle of Figure 2.

Post-hoc tests using the Bonferroni correction revealed that "I-am-aware-of-my-personal-values" ($M = 1.02$, SD = 0.42) was rated significantly higher than "It-is-a-natural-attitude-for-me-to-think-in-terms-of-values" ($M = 0.50$, SD = 0.76), ($p < 0.001$), "It-is-a-natural-attitude-for-people-around-me-to-think-in-terms-of-values" ($M = 0.16$, SD = 0.58), ($p < 0.001$) and "I-need-to-know-more-about-human-values" ($M = 0.56$, SD = 0.56), ($p = 0.003$). In addition, "I-have-general-knowledge-about-human-values" ($M = 0.83$, SD = 0.44) was rated significantly higher than "It-is-a-natural-attitude-for-people-around-me-to-think-in-terms-of-values" ($M = 0.16$, SD = 0.58), ($p < 0.001$).

Furthermore, the statistical analysis paired-sample t-test on each self-report-statements from before (pre-ws) and after the workshop (post-ws) was conducted to explore the interaction of *self-report-statements and pre/post-workshop*. The results in Table 2 indicate that students' agreement with two self-report-statements had significantly changed after the workshop; "I-need-to-know-more-about-human-values" and "I-am-aware-of-my-personal-values." In this part, "I-need-to-know-more-about-human-values" had the greatest change. This change was negative and indicated that fewer participants felt the need to know more about human values after the workshop. In addition, the number of participants who reported they were aware of their personal values significantly increased after the workshop.

The Second Questionnaire Scale measured general knowledge about human values, including five correct and four incorrect statements. To make correct and incorrect test-statements equal, we randomly selected one of the correct statements and put it out of the test. As presented in Table 3, analyzing the data indicated significant main effects of *correct/incorrect* and *pre/post-workshop*. In this case, significant interaction effects between *pre/post-workshop* and *correct/incorrect* and *correct/incorrect* and *test-statements* were found.

Table 3 shows that in this scale, the linear contrast of *pre/post-workshop*, *correct/incorrect,* and *pre/post-workshop* vs. *correct/incorrect* is significant. In addition, the data suggest linear, quadratic, and cubic significant contrasts between *correct/incorrect* and *test-statements*. These contrasts are visualized at the top and middle of Figure 3. This figure at the bottom presents the results of the descriptive analysis of each test-statement after pooling data of pre-ws and post-ws.
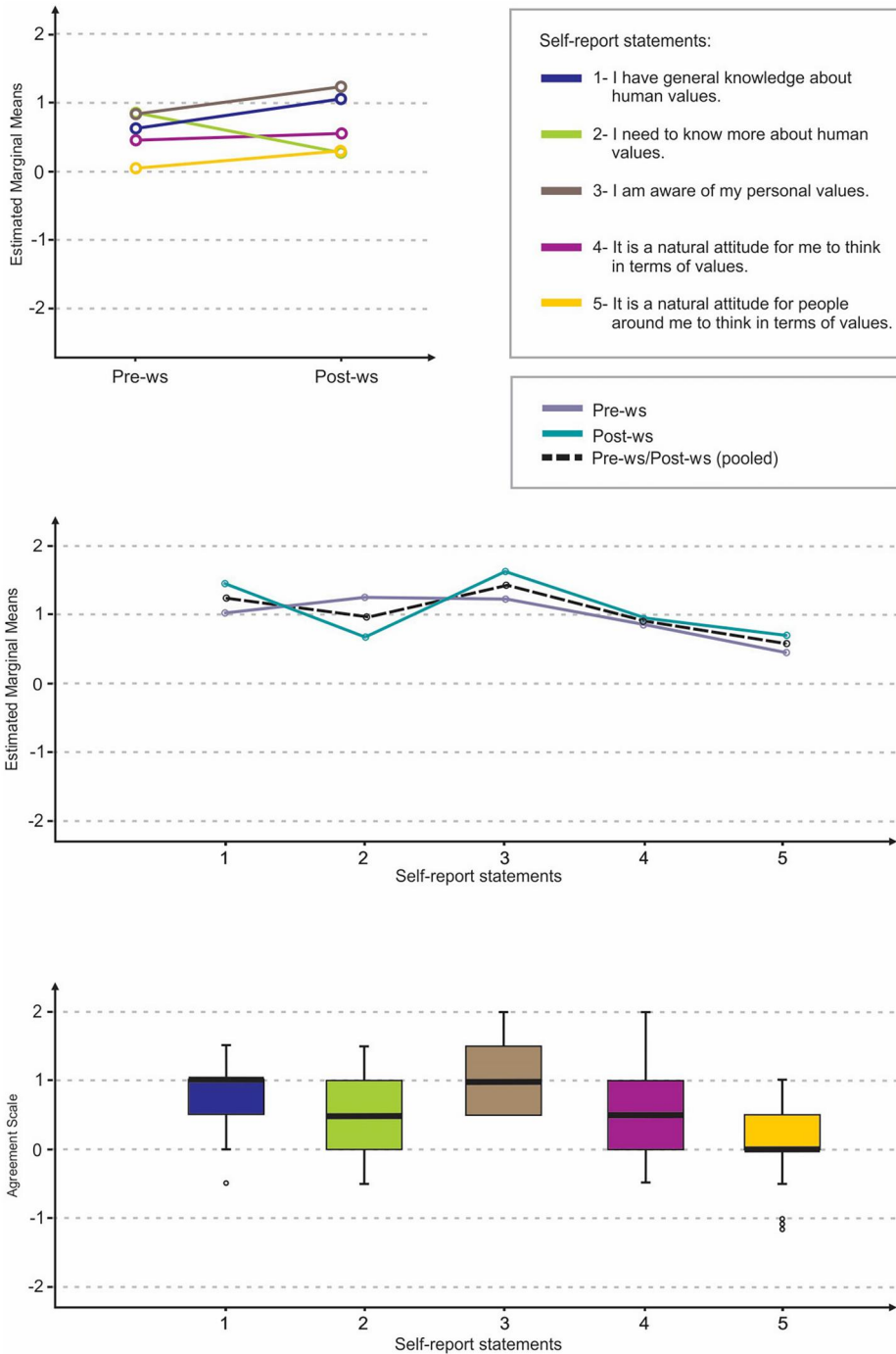
Figure 2. Visualization for results of the analysis of scale two. Significant interactions of *pre/post-workshop* and *Self-report-statements* are illustrated in two ways: Top: *pre/post-workshop* as the horizontal axis and *Self-report-statements* as separate lines. Middle: *Self-report-statements* as the horizontal axis and *pre/post-workshop* as separate lines. Bottom: Descriptive analysis of each self-report-statements after pooling data of pre-ws and post-ws.

Table 2. Results of the statistical analysis paired-sample *t*-test on scale one; pairwise comparisons of *self-report-statements* and *pre/post-workshop*.

Self-report-statements	Pre/post-workshop	Paired differences							Sig. (2-tailed)
		M	SD	Std. Error	95% Confidence Interval of the Difference		*t*	df	
					Lower	Upper			
I-have-general-knowledge-about-human-values.	pre-ws post-ws	−.425	1.152	.182	−.793	−.057	−2.333	39	.025
I-need-to-know-more-about-human-values.	pre-ws post-ws	.575	.813	.129	.315	.835	4.473	39	.001*
I-am-aware-of-my-personal-values.	pre-ws post-ws	−.400	.744	.118	−.638	−.162	−3.399	39	.002*
It-is-a-natural-attitude-for-me-to-think-in-terms-of-values.	pre-ws post-ws	−.100	.871	.138	−.379	.179	−.726	39	.472
It-is-a-natural-attitude-for-people-around-me-to-think-in-terms-of-values.	pre-ws post-ws	−.250	.776	.123	−.498	−.002	−2.037	39	.048

*Adjusted significant difference by Bonferroni method; $p < 0.01$.

Table 3. Results of the statistical analysis repeated measures ANOVA on scale two: Within-Subjects Contrasts of *pre/post-workshop*, *correct/Incorrect* and *test-statements*.

Source	Pre/post-workshop	Correct/Incorrect	Test-statements	df	F	Sig.
Pre/post-workshop	Linear			1, 38	17.374	.001*
Correct/Incorrect		Linear		1, 38	98.376	.001*
Test-statements			Linear	1, 38	.004	.951
			Quadratic	1, 38	3.178	.083
			Cubic	1, 38	.046	.831
Pre/post-workshop* Correct/Incorrect	Linear	Linear		1, 38	16.460	.001*
Pre/post-workshop* Test-statements	Linear		Linear	1, 38	3.149	.084
			Quadratic	1, 38	.468	.498
			Cubic	1, 38	1.072	.307
Correct/Incorrect* Test-statements		Linear	Linear	1, 38	15.167	.001*
			Quadratic	1, 38	11.127	.002*
			Cubic	1, 38	20.198	.001*
Pre/post-workshop* Correct/Incorrect* Test-statements	Linear	Linear	Linear	1, 38	1.382	.247
			Quadratic	1, 38	.037	.848
			Cubic	1, 38	.015	.905

*Significant difference; $p < 0.05$.

In addition, an overall significant change of correct versus incorrect statements was found; *correct/incorrect* ($M_{Cor} = 0.84$, SD = 0.32 and $M_{Inc} = -0.18$, SD = 0.53). As a post-hoc, results of the statistical analysis paired-sample t-test on overall correct statements and overall incorrect statements versus pre-ws and post-ws showed a significant difference in overall correct statements before and after the workshop (Table 4). This means students' agreement with correct statements was considerably raised after the workshop. However, their answers to incorrect statements did not change significantly.
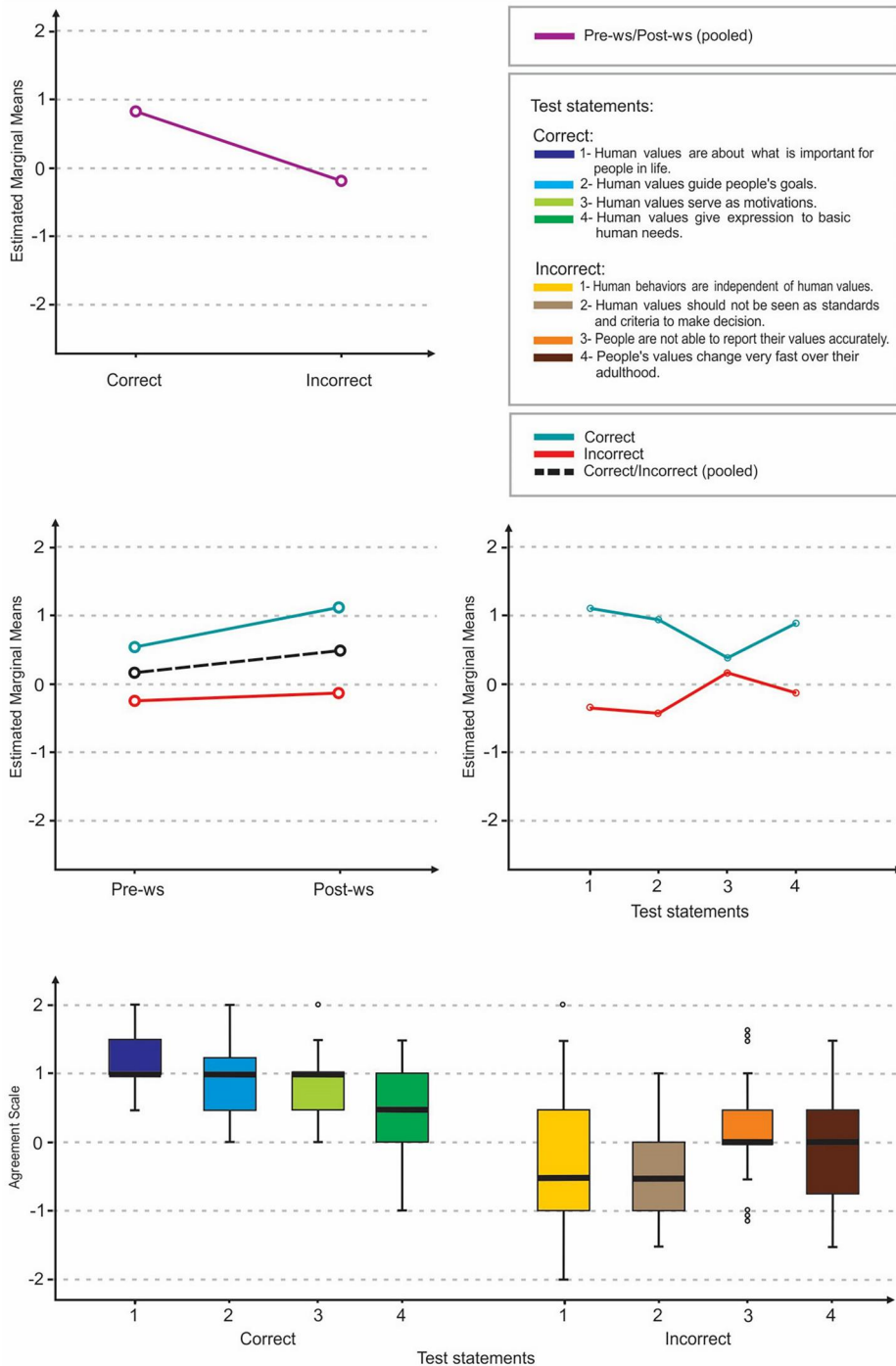
Figure 3. Visualization for results of the analysis of scale two. Top: Significant main effect of *correct/incorrect*. Middle-left: Significant main effect of *pre/post-workshop* and a significant interaction of *pre/post-workshop* with correct/incorrect; *pre/post-workshop* as the horizontal axis and *correct/incorrect* as separate lines. Middle-right: Significant interaction of *correct/incorrect* with *test-statements; test-statements* as the horizontal axis and *correct/incorrect* as separate lines. Bottom: Descriptive analysis of each test-statements after pooling data of pre-ws and post-ws.

Table 4. Results of the statistical analysis paired-sample t-test on scale two; Pairwise comparisons of *Correct/incorrect* versus *pre/post-workshop*. This test significantly differed in overall correct statements before and after the workshop.

Correct/incorrect	pre/post-workshop	Paired differences							
					95% Confidence Interval of the Difference				
		M	SD	Std. Error	Lower	Upper	t	df	Sig. (2-tailed)
Correct	Pre-ws Post-ws	−.579	.570	.090	−.761	−.397	−6.431	39	.001*
Incorrect	Pre-ws Post-ws	−.075	.660	.104	−.286	.136	−.718	39	.477

*Adjusted significant difference by Bonferroni method; p < 0.025.

Table 5. Results of the statistical analysis of repeated measures ANOVA on scale three; Within-subjects effects of the *pre/post-workshop, value/non-value, simple/complex,* and *words.*

Source	df	F	Sig.
Pre/post-workshop	1, 39	64.610	.001*
Value/Non-value	1, 39	207.027	.001*
Simple/Complex	1, 39	.003	.959
Words	7, 273	10.722	.001*
Pre/post-workshop* Value/Non-value	1, 39	52.410	.001*
Pre/post-workshop* Simple/Complex	1, 39	3.360	.074
Pre/post-workshop* Words	7, 273	4.641	.001*
Value/Non-value* Simple/Complex	1, 39	39.905	.001*
Value/Non-value* Words	7, 273	6.802	.001*
Simple/Complex* Words	7, 273	5.316	.001*
Pre/post-workshop* Value/Non-value*Simple/Complex	1, 39	1.467	.233
pre/post-workshop* Value/Non-value*Words	7, 273	8.086	.001*
Pre/post-workshop* Simple/Complex*Words	7, 273	3.120	.003*
Value/Non-value* Simple/Complex*Words	7, 273	2.215	.033*
Pre/post-workshop* Value/Non-value* Simple/Complex* Words	7, 273	2.702	.010*

*Significant difference; p < 0.05.

The Third Scale of the questionnaire was about the distinction between human values out of 40 words; Twenty-four of them were human values, and 16 of them were not human values. The human values included 16 key values from HuValue tool (eight "simple-values" and eight "complex-values") and eight "extra-values" (from the existing lists of values), and the non-values included eight "complex-words" (look like values) and eight "simple-words."

Excluding "extra-values" and running repeated measurement ANOVA on the data of values (simple and complex) versus non-values (simple and complex) from before and after the workshop showed (Table 5) significant main effects of *pre/post-workshop*, *value/non-value* and *words*. In addition, significant interactions between *pre/post-workshop* and *value/non-value*, *pre/post-workshop* and *words*, *value/non-value* and *simple/complex*, *value/non-value* and *words*, *simple/complex* and *words*, *pre/post-workshop*, *value/non-value* and *words*, *pre/post-workshop*, *simple/complex* and *words*, *value/non-value*, *simple/complex* and *words* and *pre/post-workshop*, *value/non-value*, *simple/complex* and *words* were found.

The results also show that in this scale, the linear contrasts of the *pre/post-workshop, value/non-value, pre/post-workshop* vs. *value/non-value,* and *value/non-value* vs. *simple/complex* were significant. In addition, the data suggested linear (F(1, 39) = 6.245, $p = 0.017$), quadratic (F(1, 39) = 7.246, $p = 0.010$), cubic (F(1, 39) = 20.331, $p < 0.001$), order 4 (F(1, 39) = 9.265, $p = 0.004$), order 5 (F(1, 39) = 25.055, $p < 0.001$), and order 7 (F(1, 39) = 17.535, $p < 0.001$) significant contrasts between *words.* More significant contrasts of the *pre/post-workshop* with *words, value/non-value* and *words, simple/complex* and *words, pre/post-workshop* with *value/non-value* and *words, pre/post-workshop* with *simple/complex* and *words, value/non-value* with *simple/complex* and *words,* and *pre/post-workshop* with *value/non-value, simple/complex* and *words* are visualized in Figures 4 and 5.

Results of post-hoc tests using the statistical analysis paired-sample t-test for pairwise comparisons of *value/non-value* and *pre/post-workshop and value/non-value* and *simple/complex* are presented in Table 6. These results revealed that selecting values students changed significantly after the workshop. However, this test did not show a significant difference in non-values. According to the results, before and after the workshop, the tick marks for values and non-values were significantly different; pre-ws, post-ws. In addition, students' answers for simple and complex-values and also for simple and complex non-values were significantly different; values and non-values. However, simple-values vs. simple non-values and complex-values vs. complex non-values were also significantly different; simple and complex. These results showed that after the workshop students selected values significantly more than before (M_{Pre} = 0.39, SD = 0.20 and M_{Post} = 0.74, SD = 0.24). In this case, simple-values were selected more than complex-values (M_{Sim} = 0.60, SD = 0.21 and M_{Com} = 0.52, SD = 0.22), and also simple non-values were selected more than complex non-values (M_{Sim} = 0.16, SD = 0.12 and M_{Com} = 0.08, SD = 0.12).

Further tests on pairwise comparisons of value *words* and *pre/post-workshop* revealed that selecting 9 out of 16 value words (simple and/or complex) raised significantly; "creativity" had the greatest change (t(39) = −9.539, $p < 0.001$) and "wealth" (t(39) = −6.904, $p < 0.001$), "pleasure" (t(39) = −6.297, $p < 0.001$) and "a spiritual life" (t(39) = −5.992, $p < 0.001$), "Influential" (t(39) = −5.152, $p < 0.001$), "wisdom" (t(39) = −5.152, $p < 0.001$), "true friendship" (t(39) = −5.369, $p < 0.001$), "mature love" (t(39) = −4.392, $p < 0.001$) and "self-discipline" (t(39) = −3.553, $p < 0.001$) were next.

The percentage of selecting words (Including all groups of words: Simple-values, complex-values, extra-values, simple non-values, and complex non-values) as human values by participants before and after the workshop are illustrated in Figure 6. This figure shows that in post-ws, all simple and complex-values were recognized clearly more and got more tick marks than
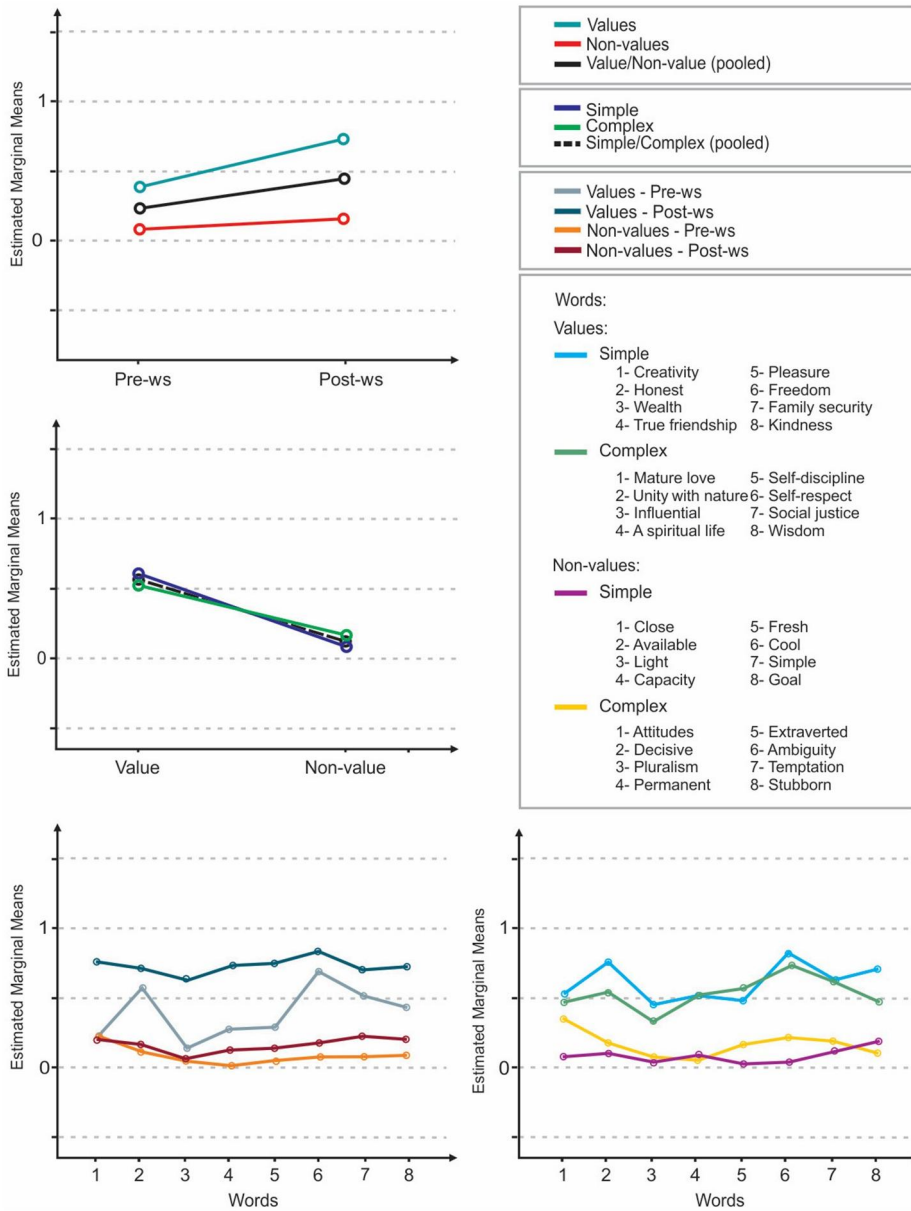
Figure 4. Visualisation for results of the analysis of scale three. Top: Significant main effect of *pre/post-workshop* and a significant interaction of *pre/post-workshop* with *value/non-value*; *pre/post-workshop* as the horizontal axis and *value/non-value* as separate lines. Middle: Significant main effect of *value/non-value* and significant interaction of *value/non-value* with *simple/complex*; *value/non-value* as horizontal axis and *simple/complex* as separate lines. Bottom–left: Significant interaction of *pre/post-workshop* with *value/non-value* and *words*. Bottom–right: Significant interaction of *value/non-value* with *simple/complex* and *words*.

other words, and only "religion" (an extra value) came in between. This figure also indicates significant value changes from before to after the workshop. For instance, "creativity" moved from 21ˢᵗ to first place, "a spiritual life"
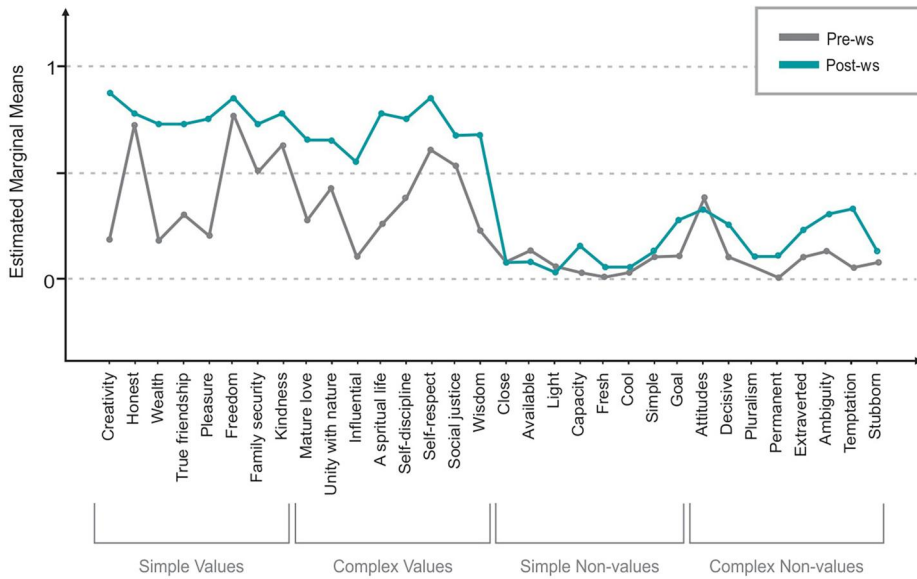
Figure 5. A significant interaction of *pre/post-workshop* with *words*; *Words* as the horizontal axis and *pre/post-workshop* as separate lines.

Table 6. Results of the statistical analysis paired-sample t-test on scale three; Pairwise comparisons of *value/non-value* and *pre/post-workshop* and also *value/non-value* and *simple/ complex*.

Source		M	SD	Std. Error	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Values	pre-ws post-ws	−.345	.212	.033	−.413	−.277	−10.287	39	.001*
Non-values	pre-ws post-ws	−.075	.194	.031	−.137	−.013	−2.449	39	.019
Pre-ws	Values Non-values	.305	.182	.029	.246	.363	10.561	39	.001*
Post-ws	Values Non-values	.575	.263	.042	.491	.659	13.809	39	.001*
Values	Simple Complex	.083	.142	.022	.037	.128	3.693	39	.001*
Non-Values	Simple Complex	.081	.106	.017	.047	.115	4.843	39	.001*
Simple	Values Non-values	.441	.221	.035	.370	.511	12.580	39	.001*
Complex	Values Non-values	.439	.209	.033	.372	.506	13.304	39	.001*

*. Adjusted significant difference by Bonferroni method; $p < 0.006$.

raised from 15th to fourth place, and "attitude," which is not a value, fell from 10th to 22nd place. On the other hand, in this case, "honest," "freedom," and "kindness," which were recognized highly before the workshop, did not change considerably.
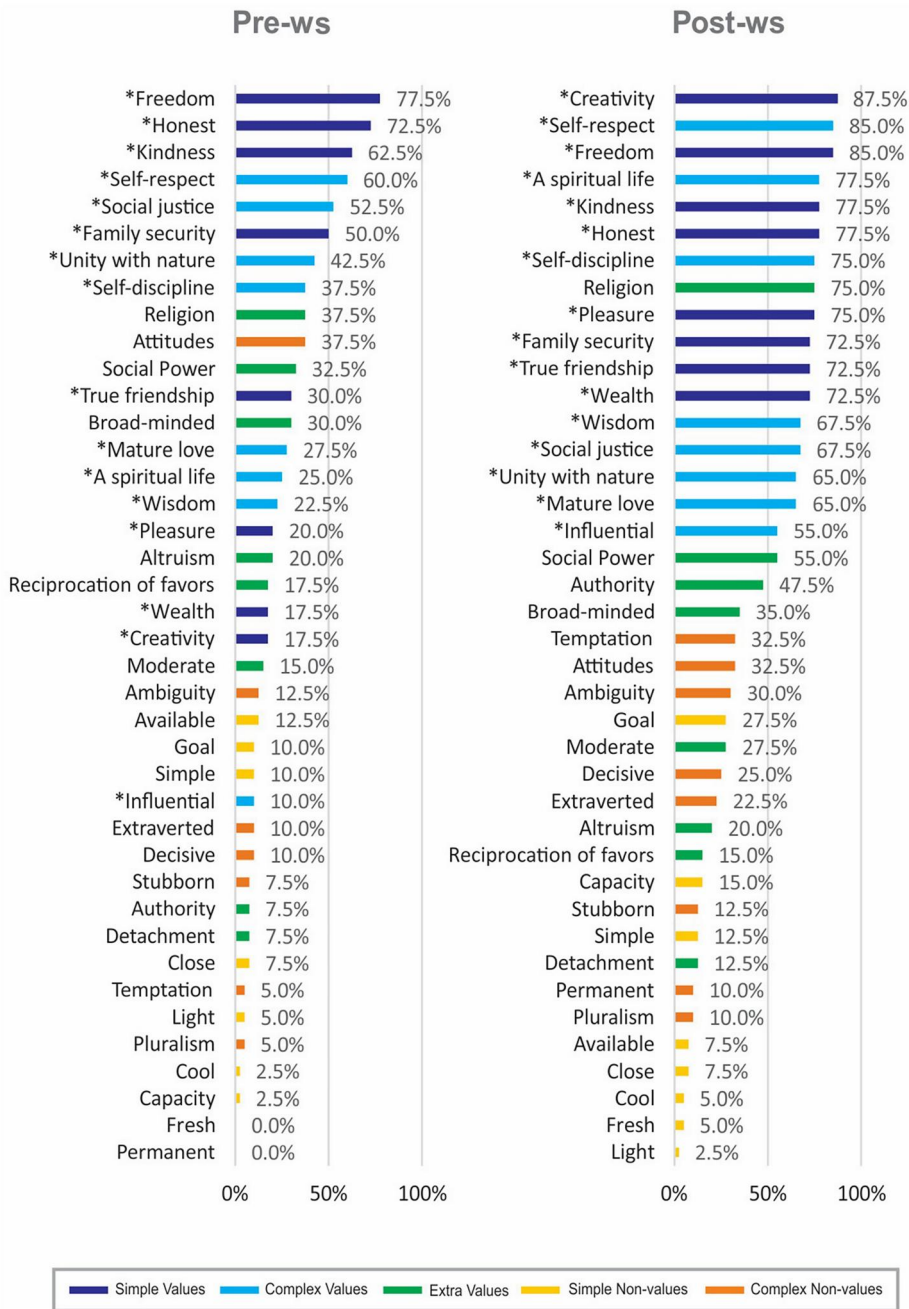
Figure 6. Percentage of selecting words as human values by participants before and after the workshop (Left: pre-ws, Right: post-ws); All groups of words are included; simple-values, complex-values, extra-values, simple non-values, and complex non-values. *Simple-values and Complex-values

Moreover, to reduce the complexity, we applied multidimensional scaling with Euclidean distance measure to visualize the data from before (pre-ws) and after (post-ws) the workshop. The stress value of pre-ws for the
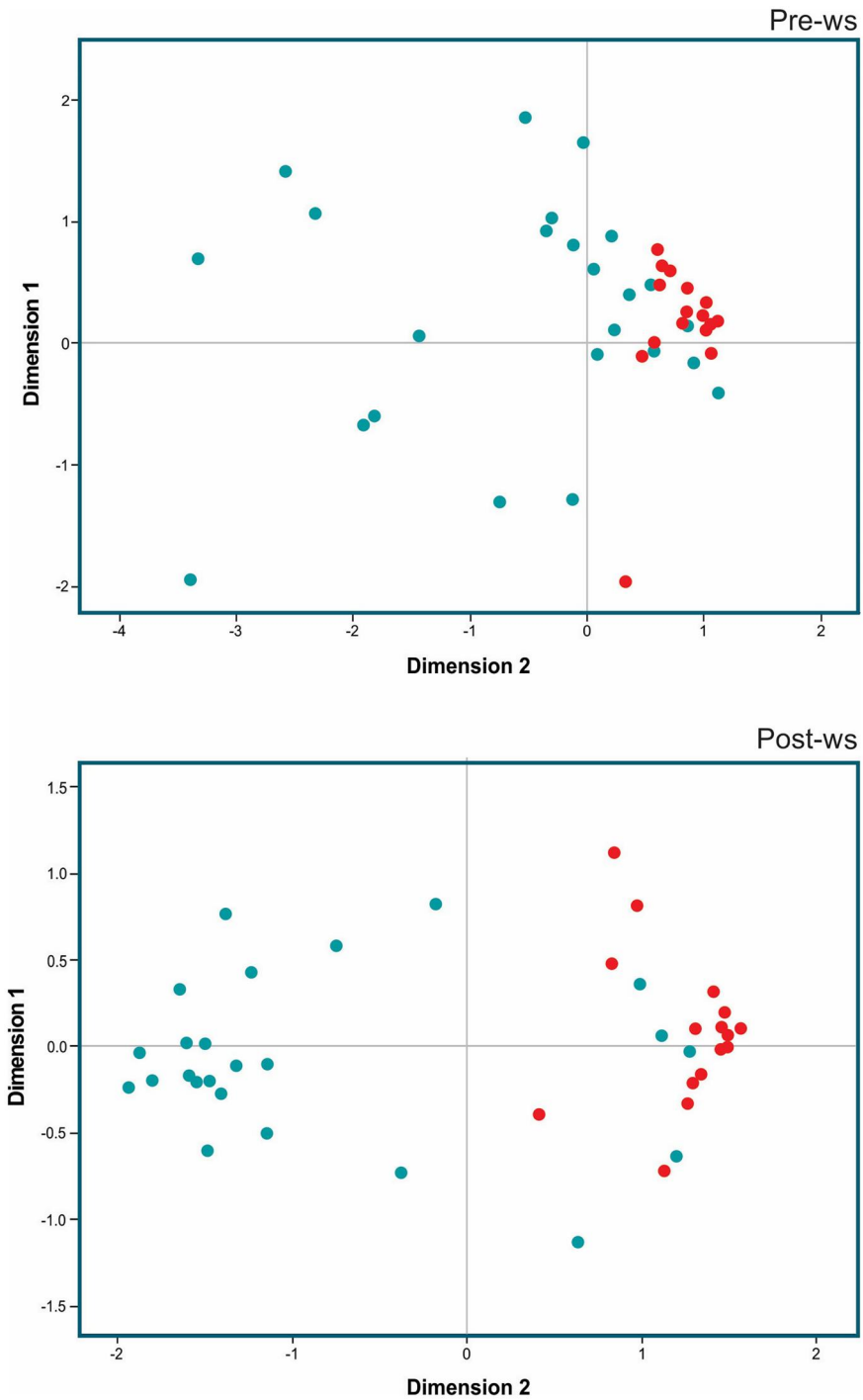
Figure 7. Two-dimensional configuration of selected words as human values; each green dot represents one value, and each red dot is one non-value. Top: pre-workshop configuration. Bottom: post-workshop configuration.

Table 7. Results of the statistical analysis repeated measures ANOVA on scale four: Within-Subjects Contrasts of *pre/post-workshop* and *everyday-life's-situations*.

Source	Pre/post-workshop	Everyday-life's-situations	df	F	Sig.
pre/post-workshop	Linear		1, 35	13.744	.001*
everyday-life's-situations		Linear	1, 35	.410	.526
		Quadratic	1, 35	3.527	.069
		Cubic	1, 35	2.641	.113
		Order 4	1, 35	32.687	.001*
		Order 5	1, 35	18.522	.001*
		Order 6	1, 35	43.291	.001*
		Order 7	1, 35	13.580	.001*
pre/post-workshop	Linear	Linear	1, 35	.104	.749
* everyday-life's-situations		Quadratic	1, 35	.013	.910
		Cubic	1, 35	.631	.432
		Order 4	1, 35	.889	.352
		Order 5	1, 35	2.037	.162
		Order 6	1, 35	1.344	.254
		Order 7	1, 35	1.306	.261

*. Significant difference; $p < 0.05$.

two-dimensional solution was 0.024, and the stress value of post-ws for the two-dimensional solution was 0.015. These indicated an excellent fit of both models for a two-dimensional solution, and post-ws model was fitter than pre-ws (Kruskal 1964). In these cases, dimension one can be defined as values/non-values (left/right), and dimension two can be defined as simple/complex (top/bottom). Comparing the results presented in Figure 7 indicates that the pattern of proximities of human values words and non-values words meaningfully changed. In fact, in post-ws, the distribution of human values words and non-values words between two dimensions made two clear groups, which is not visible in pre-ws.

The Fourth Scale of the questionnaire asked about the importance of human value awareness in everyday-life's-situations. In this scale the main effect of *everyday-life's-situations* (F(7, 245) = 16.553, $p < 0.001$) and *pre/post-workshop* (F(1, 35) = 13.744, $p \leq 0.001$) were significant. However, any significant interaction effect between these two variables was not found. From Table 7, we can see that there is a significant linear contrast in *pre/post-workshop*. In addition, the data suggested order 4, order 5, order 6 and order 7 significant contrasts between everyday-life's-situations. These contrasts are visualized at the top and in the middle of Figure 8. This figure at the bottom presents the results of the descriptive analysis of each everyday-life's-situations after pooling data from pre-ws and post-ws.

According to the results, the overall importance of human value awareness for students in everyday-life's-situations raised significantly from before to after the workshop ($M_{Pre} = 0.79$, SD = 0.31 and $M_{Post} = 0.98$, SD = 0.41). Additionally, "Communicating-with-others" ($M = 1.24$, SD = 0.55) was the most and "Routine-actions" ($M = 0.24$, SD = 0.69) was the least important situation in human value awareness. Post-hoc tests using the
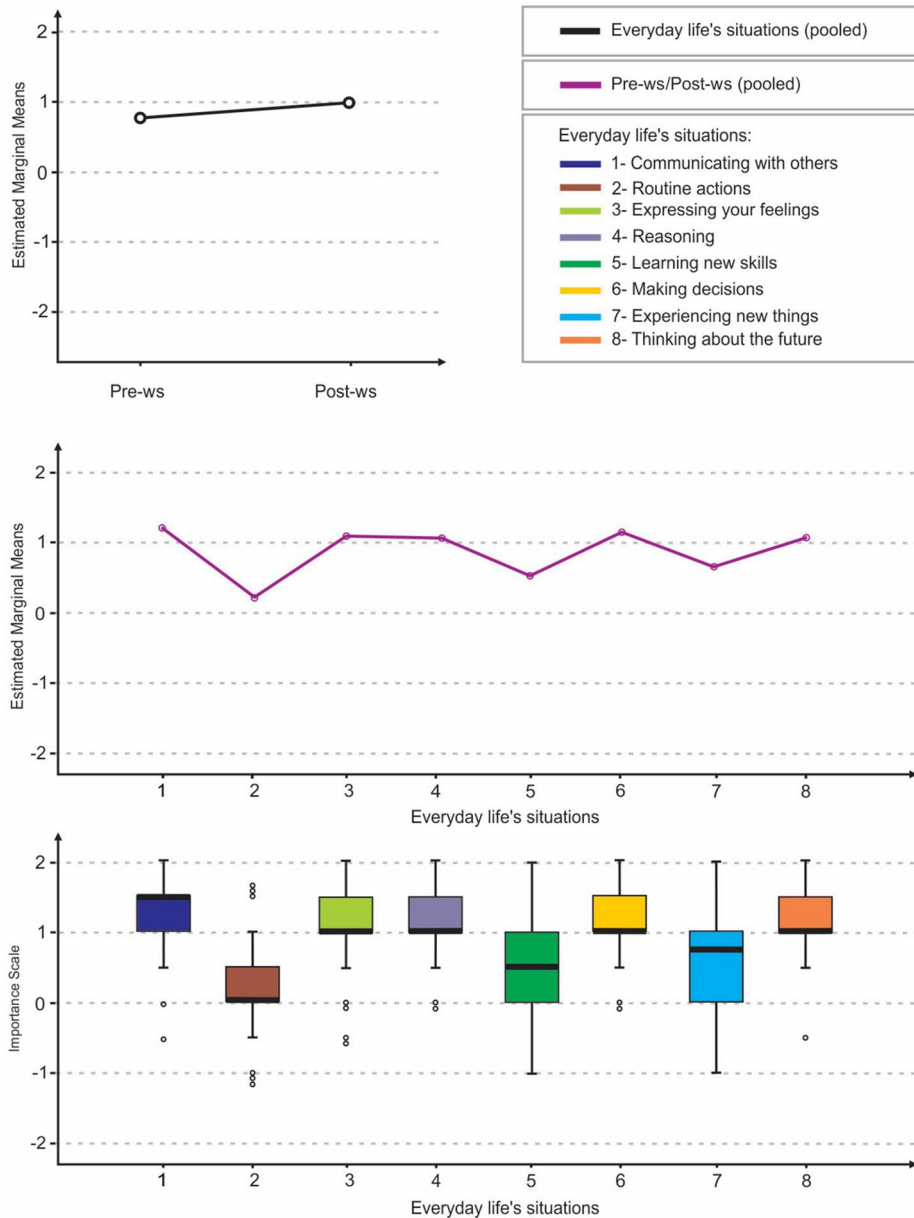
Figure 8. Visualisation for results of the analysis of scale four. Top: Significant main effect of *pre/post-workshop*. Middle: Significant main effect of *everyday-life's-situations*. Bottom: Descriptive analysis of each everyday-life's-situations after pooling data of pre-ws and post-ws.

Bonferroni correction revealed that three everyday-life's-situations were considerably different from the others; "Routine-actions" was significantly different from "Communicating-with-others" ($p < 0.001$), "Expressing-your-feelings ($p < 0.001$), "Reasoning" ($p < 0.001$), "Making-decisions" ($p < 0.001$) and "Thinking-about-the-future" ($p < 0.001$). "Learning-new-skills" was significantly

different from "Communicating-with-others" ($p = 0.004$), "Expressing-your-feelings" ($p = 0.025$), "Reasoning" ($p = 0.003$), "Making-decisions" ($p < 0.001$) and "Thinking-about-the-future" ($p = 0.011$). "Experiencing-new-things" was significantly different from "Communicating-with-others" ($p = 0.021$), "Reasoning" ($p = 0.014$), "Making-decisions" ($p = 0.006$) and "Thinking-about-the-future" ($p = 0.007$).

Discussion

In the presented research, we studied how to measure the human value awareness of design students. To achieve this goal, we executed a workshop as a learning/teaching activity and developed a questionnaire to investigate whether the workshop helps raise awareness about human values.

The results indicated that students primarily have heard about human values from their family, school, and media. However, they did not receive education on this issue. As we observed during the workshop and the results of the questionnaires approved, on the one hand, they knew what human values mean, but they did not have knowledge about the nature and function of human values. On the other hand, they knew just a few examples of human values, such as "honest," "freedom," and "self-respect." However, they did not have a comprehensive perspective on various dimensions of human values.

The workshop was designed based on the assumption that trying to find relations between value words and picture cards of activities, products, and personas *via* a playful group activity would be helpful to review and know value words and think about their relationship with everyday life. The study showed that the number of value words recognized by the students was meaningfully raised after those activities. In addition, they distinguished significantly more human values from non-values after the workshop.

The workshop had two main parts: an introductory, theoretical, abstract, and verbal presentation about human values, and the other contained two participatory, practical, and playful activities. In the first part, we described human values and their role in human life simply and briefly (around 10 min), and in the second part, participants did some playful activities with value words and their examples (about 90 min). We did not intend to teach students about human values with the workshop, but we wanted to attract their attention to this concept and help them think more this term. So, we just briefly reviewed human values, and we did not emphasize distinguishing between values and non-values since we expected that participants could easily distinguish them afterward. However, selecting non-values such as "Attitude," "Goal," and "Temptation" by around 30% of students in post-ws showed that more stress on differences between values and non-values is

necessary. In addition, negative changes of incorrect statements such as "Human behaviors are independent of human values" and "Human values should not be seen as standards and criteria to make decisions" approved that mentioning some facts per se would not be enough to grow general knowledge about human values. In other words, on the one hand, we were not firm enough in stating what human values are not and what is wrong with human values. On the other hand, students did not pay enough attention to the theoretical part, as they did not expect a test after the workshop.

Overall, the results from VAM and our observation during the workshop strongly indicate that the workshop's practical activities and participatory part were more successful than the frontal lecture. However, the participatory part also had its specific difficulties. For instance, students vary considerably in the speed of understanding/learning and doing the activity. Some groups started playing immediately, but some hesitated, and we had to explain more. Nonetheless, all students got involved with the activities and enjoyed them. Even during break time, most groups kept playing. This observation led us to conclude that to give more information about human values in a workshop, we should change the lecture part to more practical and engaging activities similar to playing with the HuValue tool, which needs a more extended session. Also, the longer-term use of the tool in different activities and various contexts can help improve the ability to distinguish values from non-values. If we insist on giving information in a short time, we have to be firm and clear and emphasize what we mean exactly. In addition, since most adult people already have their own notions about values, we should consider some time for discussing wrong ideas.

Also, Erikson et al. who identified "a unique collection of 28 challenges accompanied by inspirational suggestions for teaching activities" (Eriksson et al. 2022) mentioned HuValue tool as a relevant thesaurus, dictionary, value vocabulary for students learning values. However, our workshop and other relevant experiments with HuValue tool (Kheirandish et al. 2020b) provided evidence for effectiveness of this tool in other design process, for which the tool can be used to plan learning/teaching activities for educate design students or as a design tool to assist professional designers. Furthermore, the tool can be beneficial specially for evaluation of ideas, concepts, and products, for which Erikson et al. noticed a lack of relevant material (Eriksson et al. 2022). Besides the potential and flexibility of HuValue tool for raising awareness about human values, this research presented a quantitative method to measure this awareness, which can be used for evaluating both teachers' and learners' efforts. Such a measurement method can help to plan more effective values learning/teaching activities for training responsible designers.

Conclusion

Our answer to the overall research question in this study is yes, a workshop with the HuValue tool is capable of raising awareness about human values. The answer to this question is a general conclusion of the answers to its four sub-questions. In the first questionnaire scale, findings of pre-ws/post-ws indicated that after the workshop, students felt significantly more confident saying, "I-am-aware-of-my-personal-values," and significantly fewer participants felt the need to know more about human values, which means they believed that the workshop had a positive effect on their value awareness; Also, the results of the second questionnaire scale showed significant effects of the workshop on recognizing correct statements about human values. However, it did not have the same impact on incorrect statements. Additionally, there was more agreement about correct statements between participants and less agreement about incorrect statements; In the third scale, after the workshop, participants distinguished value words significantly more than before. This scale, considered to test value awareness, showed that after the workshop, the participant's ability to recognize human values increased. In the fourth scale, findings indicated that students already knew about the importance of human values in "Communicating-with-others," "Making-decisions," "Thinking-about-the-future," and "Reasoning." After the workshop, they discovered the role of human values even in "Expressing-your-feelings" and "Routine-actions."

Disclosure statement

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Appendix

Dear Student,
Please answer following questions:

Student number:
Gender:
Age:
Nationality:
Project theme:

Have you heard about human values before?   O YES   O NO
If so, where did you learn about human values?
☐ Family   ☐ Friends   ☐ School   ☐ Religion   ☐ Society   ☐ Medias

Please indicate to what extent you agree or disagree with the following statements:	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have general knowledge about human values.	O	O	O	O	O
I need to know more about human values.	O	O	O	O	O
I am aware of my personal values.	O	O	O	O	O
It is a natural attitude for me to think in terms of values.	O	O	O	O	O
It is a natural attitude for people around me to think in terms of values.	O	O	O	O	O

How much do you agree or disagree that sentences below are correct about human values?					
Human values are about what is important for people in life.	O	O	O	O	O
Human values guide people's goals.	O	O	O	O	O
Human behaviours are independent of human values.	O	O	O	O	O
The core of culture is formed by values.	O	O	O	O	O
Human values give expression to basic human needs.	O	O	O	O	O
Human values should not be seen as standards and criteria to make decision.	O	O	O	O	O
Human values serve as motivations.	O	O	O	O	O
People are not able to report their values accurately.	O	O	O	O	O
People's values change very fast over their adulthood.	O	O	O	O	O

Which words can be considered as human values?

☐ Broad-minded   ☐ Available   ☐ True friendship   ☐ Influential   ☐ Simple
☐ Attitudes   ☐ Social power   ☐ Extraverted   ☐ Family security   ☐ A Spiritual life
☐ Decisive   ☐ Light   ☐ Pleasure   ☐ Fresh   ☐ Goal
☐ Altruism   ☐ Mature Love   ☐ Capacity   ☐ Kindness   ☐ Authority
☐ Creativity   ☐ Wealth   ☐ Reciprocation of   ☐ Religion   ☐ Stubborn
☐ Pluralism   ☐ Unity with   favours   ☐ Temptation   ☐ Self-discipline
☐ Close   nature   ☐ Freedom   ☐ Self-respect   ☐ Social justice
☐ Honest   ☐ Permanent   ☐ Ambiguity   ☐ Cool   ☐ Wisdom
                        ☐ Moderate   ☐ Detachment

How much do you think awareness about human values is important in everyday life's situations?	Not important at all	Not very important	Neutral	Important	Very important
Communicating with others	○	○	○	○	○
Routine actions	○	○	○	○	○
Expressing your feelings	○	○	○	○	○
Reasoning	○	○	○	○	○
Learning new skills	○	○	○	○	○
Making decisions	○	○	○	○	○
Experiencing new things	○	○	○	○	○
Thinking about the future	○	○	○	○	○

Group activity

Gather your group:
- Find your groupmates (project group)
- Receive a set of value wheel, value words and picture cards from Shadi.
- Place the value wheel in the middle of a table.
- Sit around the table.

1- Group discussion (15 min):
- Pick up "Deck A" of picture cards.
- Look at the cards one by one, read the text and discuss what each card is about with your groupmates.
- Put the card in the middle of the circle and discuss:
  Which group of values does this card belong to?
- Put each card close to the relevant group of values around the value wheel.

2- Group game (20 min):
- Take "Deck B" of picture cards.
- Deal the cards to all group members.
- Put the value words down in the middle of the value wheel.
- In each round:
·· Flip over the top value word.
·· Let the youngest person start and then continue clockwise.
·· Every player should find one relevant example among her/his cards to the face-up value words and explain how they are relevant. (In each round every player has only one chance)
·· For each example, the other players should discuss and vote the example as "relevant" or "irrelevant";
If two or more persons agree, the player can place the example close to the relevant group of values around the value wheel. Otherwise, s/he should keep the card in her/his hand.
- The game ends when the value words are out, the person with the least picture cards wins.

Individual activity

1- Rank the groups of values in their order of importance to you (5 min):
- Receive a set of value wheel, value words and activity picture cards from Shadi.
- Place the value wheel in front of you.
- Write your name in the middle.
- Review all groups of values in the wheel.
- Ask yourself:
  Which group(s) is important for you in life?
  How much do you care about each group?
- Rank them in their order of importance to you by crossing circles from "not important" to "extremely important".

2- Find important values for you (5 min):
 - Pick up the value words.
 - Read the value words one by one and ask yourself:
   "Is this value important for me or not?"
 - Make two piles of cards: "important" and "not important."
 - Keep piles.

3- Find important activities for you (5 min):
 - Pick up the activity picture cards.
 - Look at the cards one by one and ask yourself:
   "Is this activity important for me or not?"
 - Make two piles of cards: "important" and "not important."
 - Keep piles.

4- Assign your important activities to groups of values (5 min):
 - Take the "important" pile of picture cards from the last step one by one.
 - Review what the picture card is about.
 - Put the card in the middle of the value wheel and ask yourself:
   Which group of values does this activity belong to?
 - Put each card close to the relevant group of values around the value wheel.

5- Assign your values to your important activities (5 min):
 - Take the "important" pile of value words from step 2 one by one.
 - Relate each value to the activities, which are placed around the value wheel in the last step.
 - Put each card close to the relevant activity and group of values around the value wheel.

6- Arrange your value-board (5 min):
 - Prepare the table for a photo and be sure that every card is readable;
   Shadi is going to take a photo and print it later in A2 for you.