

A Reputational Texts through POEAW Tasks to Encourage Eleven Grade Pupils' Conceptual Understanding about Momentum-Impulse

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Abstract

The aims of this research to develop a reputational text through POEAW tasks to encourage eleven grade pupils' conceptual understanding about momentum-impulse. The model of 3D+1I utilized in this research and 30 pupils eleven grade as the participant in the senior high school. The instrument utilized has been Conceptual Survey on Impulse-Momentum (CSIM) consist of 15 questions. The research was steered in the subsequent steps: 1) Defining, studying the concept and misconception on physics; 2) Designing, project the reputational text; 3) Developing, reputational text joined with the POEAW worksheet; 4) Implementing, the participant is 30 pupils from senior high school. The result specifies the most of all reputational from misconception toward partial understanding category is 86,7%. The smallest from understanding to sound understanding category is 6,7%. The conclusion is the reputational text through POEAW be able to encourage pupils' reputational about momentum-impulse.

Keywords: reputational text, POEAW, conceptual understanding, momentum-impulse

1. Introduction

Understandability is an aptitude utilized on the information assignment procedure. Aptitude know is thoroughly connected toward the procedure, making connotation of outcomes from the education events implement. The procedure contains possessions written, believed, and designated. Somebody measured toward conceptual understanding able to mark an assembly among new information and initial information. By creating an assembly among that, pupils can attraction sense or communication from the difficulties they appearance.

Conceptual understanding is key to thing because understanding is a simple capability that pupils' necessity takes before principal more multifaceted capabilities. Understanding is a procedure of mixing and connecting numerous types of information that have been influenced. The procedure of understanding is a procedure of structure import carried out by pupils. With the skill to conceptual understanding, pupils can concern ideas or embody relations and addition among numerous concepts. In tally, pupils are able to smear the concept to numerous conditions, can describe the condition or concept by charitable rational motives, and can embody the concept in numerous conducts such as expressing and can prompt the connection among depictions. Such depictions are similar to how to mark charts and equation connected depictions and can do the procedure of structure denotation.

Base on a literature study shows the designate that the popular of pupils are motionless at a small tier of understanding or are at the tier of partial understanding [1]-[5]. They sustenance the consequences of a primary education directed by the playwright in one school at Cirebon. Presented of the result that pupils responded with 84.62% erroneously on problem-solving concerning the impulse relations concept, force, and interaction of time.

The pupils think, the force touches the objects' velocity, while the point of force touches the acceleration of object. In tally, there are mistakes in conceptual understanding of impulse, and it's relative to the interaction of time and force accepts. Nearly pupils trust the quicker interaction of time, and the force gained is superior. The superior force has the result of an injury that items accept develops smaller. The kind of connection amongst impulse-force and impulse-time intermission contrariwise relative. However, in the correct concept, impulses are straight relative toward force and unswervingly relative toward time.

The understanding of pupils about the momentum-impulse concept is small, this is designated through the pupils' statement that impulses change kinetic become potential energy. Pupils expected in interplanetary the mass had no consequence, as of the nonappearance of gravity. In tally, it's an alteration on momentum practiced by substances when in earth and space. While in concept correctly, the mass continually there, thus, the objects' momentum resolves continually, same the equally on space and earth. The pupils' conceptual understanding will hypothesis the idea erudite by connecting the already recognized concepts toward the new concept's existence calculated [6]-[9]. The pupils' concepts have of things are named conception [10]-[12]. Conception is the personification of the pupil opinions in conceptual understanding. One pointer that displays pupils' understanding modifications for the well is the alteration in the concept that pupils have. The modification is exposed as a conception that is less scientific addicted to scientific conception. Pupils continuously take a conceptual understanding will be erudite in their concentrations earlier responsibility education events. The concept originates from daily involvements that are usually met. The pupils cannot be unglued from the early concept that is previously possessed in scientific learning. The concept is frequently mentioned as the early concept, information, simple concept, and the others [13]-[17].

Some while, the concept controlled by pupils is previously scientific or unscientific. Several pupils' concepts deny scientific concepts which are really recognized as called misconceptions [18]-[20]. This is why the concept must be enhanced. When such preceding information is not agreement by scientific concepts, the misconception is constructed thus, pupils cannot study successfully. A procedure of concept modification carried out to equilibrium present misconceptions [6]. In tally to misconceptions, extra belongings that avert pupils from conceptual understanding are the concept that is less real or the concept existence deliberate is abstract. One of the abstract concepts in physics is momentum-impulse. The momentum-impulses concept is actually nearby to our everyday doings, nonetheless, the proceedings erudite in this concept happen in actual small time. Thus, several actions connected to the momentum-impulses concept that cannot be experiential right. To convey this abstract concept, numerous systematic representations stand utilized, and some exact concepts. This is hard for pupils' conceptual understand momentum-impulses.

Additional motives that create pupils take a small conceptual understanding because the pupils' determination to answer their specific difficulties without response as of the instructor, pupils' acuities of physics as hard topics make pupils not absorbed in resonant out class education and instructors who wage attention to pupils' increase [21]-[23]. Problems in understanding can hamper pupils from realizing advanced abilities.

The alternative solutions utilized to enhance pupils' conceptual understanding is used to change the conception with reputational text. Reputational text is a technique that describes pupil misconceptions and attempts to clarify these mistakes from the text having samples, be able to create in daily activities. The reputational text shows through clarification and sample of pupils' possessions have assumed are not ample or mistaken. It is one of the vital approaches utilized to remove conceptual mistakes and is based on a method of moving conceptions [24]. The text is using to conversion concept on the optics themes, temperature-heat, electricity, motion, and sound in numerous heights fluctuating since elementary toward effective universities and impart concepts, and recover pupils' conceptual understanding [25]-[31]. The transcript of the reputational text was industrialized founded in the method of conceptual changes. This is relating to the integration attitude, guideline, and stability [6].

In the integration process, pupils match the concepts educated through the ancient concepts pupils have. In addition, the new evidence to reconstruct the concept in mind. The pupils' concepts have occasionally been still erroneous or have misconceptions. Current misconceptions are able to delay this integration practice. Then, fresh concepts of educated necessity are able toward substitute longstanding concepts that strength stagnant on incorrect. The substituting procedure is called the method of reputational. The method of moving this conception necessity can stability the pupils' misconceptions.

The method to changing conception has four situations that duty is realized thus, that a mistaken concept able to substitute by the scientific concept [32] include:

- 1) Dissatisfaction: Pupils make discontented with the knowledge that is already acknowledged. Thus, pupils understand that the information has is not ample.
- 2) Intelligibility: Pupils duty willingly understand new concepts educated.
- 3) Plausibility: Pupils duty novelty new opinions and able to define those opinions in attention.
- 4) Fruitfulness: Pupils duty be able to problems-solving use the new concepts.

Four conditions previously, the text for reputational duty can create pupils have a conflict of cognitive in their awareness. The variety of moving understanding starts with a problem to trigger the misconception pupils have. Likewise, misconception frequently happens connected to the theme of conversation are showed. Pupils are requested for ideas concerning the misconception that habitually have. This is complete to can reconnoiter the misconceptions that pupils have. Following, the text is showed that be able to demonstrate that nearby is a hole among the old information pupils have through the concepts they will study. Therefore, cognitive conflict happens in the pupils' minds. Finished this procedure, pupils are likely to can substitute the misconceptions strength pupils have with the concepts of scientific. This is the procedure for reputational. If the procedure of changing understanding has happened, pupils are able to current fresh material through numerous illustrations and change the pupils' misconceptions have by the real concept of scientific.

Concluded course of the altering pupils' conceptions as of longstanding concepts to scientific concepts in the environment, there is a growth in understanding of pupils. The near to understanding it has an intensification. The effect of the improved near of concept knowledge is a cumulative reputational in the pupils' concept.

The reputational text industrialized has assimilated into the POEAW. The POEAW is an increase of Predict-Observe-Explain-Apply (POEA) and increase of Think-Talk-Write (TTW). POEAW takes five steps, with Predict-Observe-Explain-Apply-Write. This learning model added of the Write stage. The Write stage adding as the effect of the use of Think-Talk-Write approaches.

The model of learning POEAW practices a method to reputational conception. The core mechanism to be attained complete the usage of a technique to reputational conception is the procedure of successful understanding. The pupils carry information when education a new concept [41], [42]. To stimulate the information/concepts detained by pupils, the first step in the POEAW starts through an analytical stage. In predicting, pupils be able to reboot their longstanding information.

The longstanding information occasionally comprises misconceptions that can delay the course of pupils' conceptual understanding. After that, the following stage is observation. With observing, pupils be able to treasure new concepts and get holes among the things they detect and the importance of pupils' information. Next, pupils are able to explain the motives for an occurrence and explain the variances among predictions and observations. After that, a procedure of structure concepts receipts abode in the pupils' minds. The new knowledge that has been advanced be able to be utilized for problem-solving associated with the new concept. Finished the process of discussion and writing, pupils are able to redesign their understanding of the knowledge.

Through education and knowledge doings in the class [43], [44], the trusted that original scientific concepts be able to reputational the current misconceptions. Once a misconception is well changed through a new scientific concept, the procedure of reputational is taken place. The around of reputational indicates is conceptual understanding after teaching and learning activities. This healthier proposes has been a proliferation in pupils' conceptual understanding. Education with the reputational or conceptual change approach is handy for improving the knowledge of concepts [29].

2. Methodology

2.1. Research Method

The 3D+1I models (Defining, Designing, Developing, and Implementing) as the research method that we used [18]. The step of defining, responsibility literature on the concept of physics and its mutual misconception. The step of designing, designing the force of the reputational text, and select the substance. The step of developing, they are creating a mission to unified into reputational text. And, the step of implementing, responsibility the education procedure uses the reputational text and without reputational text. The two-class are scholarly expending POEAW without the reputational text in control class and are use the reputational text in the experiment class.

2.2. Participant

The participant utilized there is 30 pupils' eleven grade at senior high school. The pupils get pre-test and post-test, before and after treatment.

2.3. Instrument

We utilized an instrument of diagnostic tests on momentum-impulse with the kind of four-tier test instrument. This instrument called Conceptual Survey on Impulse-Momentum (CSIM). The CSIM instrument utilized to find misconception and pupils' level of conceptions [5], [34], [35]. The CSIM is a multiple-choice, and respectively interrogation has four-tiers. Construction of CSIM instrument test has the procedure of the question such as the tier 1 for the question, the tier 2 for the level of confidence from question answer in the tier 1, the tier 3 for the reason question answer in the tier 1, and the tier 4 for the level of confidence from question answer in the tier 3 [18]. The CSIM instrument contains of 15 problems on momentum-impulse. The CSIM sample can view on Figure 1.

Momentum is is the product of the mass and velocity of an object. A bus moves on a road as shown in Figure 1.

Position 1 $v_1 = 50\text{km/hour}$ /jam
 Position 2 $v_2 = 50\text{km/hour}$ /jam
 Position 3 $v_3 = 50\text{km/hour}$ /jam

Figure 1. A bus moves on the road

What is the momentum and impulse owned by the bus?

	Momentum (\vec{p})	Impuls (\vec{I})
a.	$\vec{p}_1 = \vec{p}_2$	There is no \vec{I} from position 1 to position 2
b.	$\vec{p}_1 = \vec{p}_2$	The impulse from position 1 to position 2 same as \vec{p}_1 and \vec{p}_2
c.	$\vec{p}_1 > \vec{p}_3$	The impulse from position 1 to position 2 same as \vec{p}_1 dan \vec{p}_3
d.	$\vec{p}_1 < \vec{p}_3$	There is no \vec{I} from position 1 to position 2
e.	$\vec{p}_2 = \vec{p}_3$	The impulse from position 2 to position 3 is bigger than position 1 to position 2

The Confidence Level of the Selected Answer

Sure Not Sure

The Reason :

- There is no velocity on position 1 to position 2, so there is no change on momentum and no impulse.
- Velocity in position 1 same as position 2 and have the same mass so that the momentum of both is the same and has the same impulse.
- Velocity in position 1 same as position 2 and have the same mass so that the momentum in position 1 same as position 2. On this position there is no impulse because there is no change of time.
- Momentum and impulse are able to determine the position of an object, if the velocity is the same then both impulses are the same.
-

The Confidence Level of the Selected Reason



Sure Not Sure




Figure 1. The sample of CSIM

2.4. Data Analysis

We analyze the data based on the results of the pre-test and post-test. Pupils answer to pre-test and post-test prearranged to be treated and examined. The result of programmed taken to pupils is a level conception. The five levels conception we used in this research, include Sound Understanding (SU), Partial Understanding (PU), No Understanding (NU), Misconception (MC), and Un-Coddable (UC) [36] like on Table 1 [33].

Table 1. Score for Level Conception

Level Conception	Symbol	Tier				Score
		1	2	3	4	
Sound Understanding (SU)		T	S	T	S	2
Partial Understanding (PU)		T	S	T	NS	1
		T	NS	T	S	
		T	NS	T	NS	
		T	S	F	S	
		T	S	F	NS	

Level Conception	Symbol	Tier				Score
		1	2	3	4	
		T	NS	F	S	
		T	NS	F	NS	
		F	S	T	S	
		F	S	T	NS	
		F	NS	T	S	
		F	NS	T	NS	
No Understanding (NU)		F	NS	F	S	0
		F	S	F	NS	
		F	NS	F	NS	
Misconception (MC)		F	S	F	S	0
Un-Coddable (UC)		Pupils not responding/realize all on amount of tier in CSIM				0

Note: T = True; S = Sure; F = False; NS = Not Sure

The collected of data in the CSIM instrument is pupils' level conception. Pupils' level conception is utilized to analyze pupils' understanding before and after treatment. Furthermore, pupils' reputational text assimilated with POEAW question sheet is utilized to sustenance a result on CSIM.

Pupils' reputational acknowledged by scheming the change of pupils' level conception percentage in pretest and posttest. The percentage of pupils' reputational intended shown in Equation 1 [36].

$$(\%) \text{ Pupils Reputational (PR)} = \pm((\%)Post - (\%)Pre) \quad (1)$$

Notes:

(%) PR = Percentage of pupils reputational

(%) Pre = Percentage of pupils level conception at pre-test

(%) Post = Percentage of pupils level conception at post-test

The negative symbol (-) is utilized aimed at the Misconception, No Understanding, and Un-Codeble changes. Although, the positive symbol (+) is utilized aimed at the Sound Understanding, and Partial Understanding changes.

Reputational percentage categorized as three change kinds that is zero (0), positive (+), and negative (-). This change is unforeseen changes or No Acceptable (NA) while zero changes (0) designate that there stay no changes in pupils' level conception. Positive changes designate that is an improvement on pupils' level conception. Pupils change to be improved after education. This change is predictable changes or Acceptable (A). Negative change designate that is a failure in pupils' level conception. The percentage of pupils' level conception the same between pre-test and post-test. These changes named No Change (NC). Interpretation of symbol category of pupils' reputational presented in Table 2 [36].

Table 2. Interpretation of symbol category of pupils' reputational

Category	Interpretation (Itp)
-	No Acceptable (NA)
0	No Change (NC)
+	Acceptable (A)

3. Results and Discussion

The POEAW tasks reputational text was utilized to improve pupils' conceptual changes. The advance of this education typically shadows the 3D+1I model (Defining, Designing, Developing, and Implementing).

3.1. Defining

In defining part, we study the concept and misconception in physics, and the concept of momentum-impulse is selected. The resulting study about misconception displays that there is a mistake around the knowledge of momentum-impulse and pupils' insentient of the vector on energy. Approximately misconceptions of energy and motivation from the study of the works were utilized as a transfer to advance this investigation.

The reputational text design is modified toward four situations in the conceptual changes force [32], which is a disappointment, perspicuity, believability, and productivity, and have five slices [6]. Similar to the reputational text, POEAW have the five stages: 1) Predict; 2) Observe; 3) Explain; 4) Apply, and; 5) Write. We mix the reputational text and POEAW task.

In stage 1, the text and difficulties around a disorder bent by everyday life, the aim to classify likelihood of pupils' misconception. Stage 2, collective misconception, and pupils requested to stretch knowledge around the misconception. Stage 3 is observed. This stage is reputational text and an attendant around education activity like viewing demonstration or video and exploit simulation. Kind clarifies around problems and misconceptions in stages 1 and 2.

Stage 4 is explaining. Pupils requested to express any problems related with stage 3. And the latest, stage 5 is applied. In this case, pupil understanding is very necessary. The inscribe stage on POEAW anxiety in the stage in this task because all of the units' rejects stage 3 has a scripted course. Toward enlarge script course, afterward pupils ample the education action, they are the inscribe an everyday life reflection slip on their education action and understanding.

The POEAW task used in the experiment class with reputational text, though in the control class usage POEAW task minus reputational text. There are differences in stage 3. At the experiment class, stage 3 has any reputational text and an attendant on education action, while, in the control class, stage 3 just attendant education action. Pupils expenditure example book in this stage.

3.2. Designing

We designing the reputational text according to stage 1 (defining). This design can be seen in Figure 1

3.3. Developing

The momentum-impulse concept has been utilized to advanced reputational text in POEAW. There are three units in this education, thus we create three assignments. The segment consists of momentum, connection of momentum-impulse, and collision and conservation of momentum.

3.4. Implementing

The participants on this research are 30 pupils in senior high school. The result of CSIM presented on Table 3 and Table 4.

Table 3. Changes in the level of pupils' conception (Un-Coddable, Misconception, and No Understanding)

No.	Pupils' Level Concepton														
	Un- Coddable (UC)					Misconception (MC)					No Understanding (NU)				
	Pre-test	Post-test	PR %	Type	Itp.	Pre-test	Post-test	PR %	Type	Itp.	Pre-test	Post-test	PR%	Type	Itp.
1	-	-	0,0	0	NC	P7, P11, P12, P13, P17, P22, P24, P25, P30	P12, P13, P17, P18	16,7	+	A	P9, P14, P26, P27	P10, P14	6,7	+	A
2	-	-	0,0	0	NC	P2, P3, P7, P9, P10, P11, P12, P16, P17, P19, P24, P25, P27, P28, P30	P2, P7, P9, P11, P14, P15, P16, P28	23,3	+	A	P6, P14, P29	P13, P19	3,3	+	A
3	-	S22	-3,3	-	NA	P2, P3, P8, P10, P11, P14, P17, P22, P24, P28, P29, P30	P8, P10, P11, P12, P24	23,3	+	A	P13, P15, P25, P26, P27	P26	13,3	+	A
4	-	-	0,0	0	NC	P2, P15, P16, P17, P25, P29, P30	P7, P15, P25	13,3	+	A	P9, P28	P16	3,3	+	A
5	-	-	0,0	0	NC	P3, P6, P7, P12, P13, P14, P15, P18, P19, P20, P21, P22, P23, P24, P25, P26	P2, P3, P7, P13, P14, P15, P17, P24	26,7	+	A	P27, P28, P29		10,0	+	A
6	-	-	0,0	0	NC	P2, P3, P5, P7, P9, P12, P15, P16, P17, P19, P23, P24, P25	P1, P5, P9, P12, P15, P17, P19, P20, P24	13,3	+	A	P1, P6, P11, P13, P21, P26, P27, P28	P16	23,3	+	A
7	-	-	0,0	0	NC	P2, P5, P7, P8, P9, P11, P12, P13, P14, P16, P18, P19, P20, P21, P22, P24, P29	P2, P3, P8, P9, P10, P13, P17, P18, P19, P20, P24	20,0	+	A	P1, P3, P4, P10, P16, P23, P28, P30	P5, P14, P16, P30	13,3	+	A
8	-	-	0,0	0	NC	P2, P3, P4, P7, P8, P12, P13, P16, P18, P20, P24, P28, P30	P2, P3, P7, P8, P15, P18	23,3	+	A	P1, P5, P6, P9, P19, P21, P23	P6, P9, P16, P19, P23	6,7	+	A
9	-	-	0,0	0	NC	P2, P5, P6, P8, P10, P11, P12, P15, P22, P23, P24, P25, P30	P1, P5, P6, P8, P20, P24	23,3	+	A	P4, P7, P16, P19, P28, P29	P7, P12, P21	10,0	+	A
10	-	-	0,0	0	NC	P1, P7, P12, P15, P16, P25, P26, P27, P28, P29	P7, P25, P27	23,3	+	A	P6, P9, P13, P14, P17, P19, P21, P23	P6, P9, P10, P19, P21	6,7	+	A
11	-	-	0,0	0	NC	P10, P20, P25, P29,	P15	13,3	+	A	P26, P27		6,7	+	A

No.	Pupils' Level Conception														
	Un-Coddable (UC)					Misconception (MC)					No Understanding (NU)				
	Pre-test	Post-test	PR %	Type	Itp.	Pre-test	Post-test	PR %	Type	Itp.	Pre-test	Post-test	PR%	Type	Itp.
						P30									
12	-	-	0,0	0	NC	P2, P3, P4, P7, P14, P15, P16, P19, P20, P22, P24, P25, P26	P2, P3, P4, P12, P16, P17, P19	20,0	+	A	P10, P13, P27, P28	P14, P26	6,7	+	A
13	-	-	0,0	0	NC	P7, P8, P17, P18, P19, P20, P22, P26, P27, P30	P7, P11, P13, P17, P18	16,7	+	A	P6, P10, P11, P13, P21, P28	P10, P16	13,3	+	A
14	-	-	0,0	0	NC	P2, P3, P14, P20, P22, P24, P25, P26, P28, P30	P5, P14, P24, P25, P27	16,7	+	A	P5, P16, P27, 29	P16, P22	6,7	+	A
15	-	-	0,0	0	NC	P3, P4, P8, P11, P12, P15, P18, P21, P22, P23, P25, P26, P27	P3, P8, P12, P14, P20, P21	23,3	+	A	P5, P6, P13, P28, P29	P10, P16, P23, P28	3,3	+	A
Average			-0,2		NA			19,8		A			8,9		A

Note: PR= Pupil Reputational; Itp= Interpretation; The symbol of P= Pupil

Table 4. Table 3. Changes in the level of pupils' conception (Partial Understanding and Sound Understanding)

No.	Pupils' Level Conception									
	Partial Understanding (PU)					Sound Understanding (SU)				
	Pre-test	Post-test	C (%)	Type	Itp.	Pre-test	Post-test	C (%)	Type	Itp.
1	P1, P2, P3, P4, P5, P6, P8, P10, P15, P16, P19, P20, P21, P28, P29	P1, P2, P3, P4, P5, P6, P7, P9, P11, P15, P16, P19, P22, P24, P25, P26, P27, P30	10,0	+	A	P18, P23	P8, P20, P21, P23, P28, P29	13,3	+	A
2	P1, P8, P15, P18, P20, P21, P23, P26	P1, P3, P6, P8, P10, P12, P18, P20, P24, P25, P27, P29, P30	16,7	+	A	P4, P5, P13, P22	P4, P5, P17, P21, P22, P23, P26	10,0	+	A
3	P1, P4, P5, P6, P7, P9, P12, P18, P19	P2, P4, P6, P7, P13, P14, P15, P16, P17, P19, P25, P27, P28	13,3	+	A	P16, P20, P21, P23	P1, P3, P5, P9, P18, P20, P21, P23, P29, P30	20,0	+	A
4	P3, P5, P7, P10, P11, P13, P14, P21, P22, P23, P24, P26, P27	P1, P5, P6, P8, P9, P10, P11, P13, P14, P17, P18, P26, P28, P29, P30	6,7	+	A	P1, P4, P6, P8, P12, P18, P19, P20	P2, P3, P4, P12, P19, P20, P21, P22, P23, P24, P27	10,0	+	A
5	P1, P5, P8, P10, P16, P30	P1, P5, P10, P11, P21, P22, P23, P26, P27, P28, P29, P30	20,0	+	A	P2, P4, P9, P11, P17	P2, P6, P8, P9, P12, P16, P18, P19, P20, P25	16,7	+	A
6	P4, P8, P10, P14, P18, P20, P22, P29	P2, P3, P4, P6, P7, P8, P10, P11, P13, P14, P21, P25, P26, P27, P28	23,3	+	A	P30	P18, P22, P23, P29, P30	13,3	+	A
7	P6, P15, P26, P27	P1, P6, P7, P11, P12, P15, P21, P22, P23, P26, P27, P29	26,7	+	A	P25	P4, P25, P28	6,7	+	A

No.	Pupils' Level Conception									
	Partial Understanding (PU)					Sound Understanding (SU)				
	Pre-test	Post-test	C (%)	Type	Itp.	Pre-test	Post-test	C (%)	Type	Itp.
8	P10, P14, P15, P17, P22, P25, P26, P27, P29	P1, P4, P5, P10, P11, P12, P13, P14, P20, P21, P22, P24, P25, P27, P29, P30	23,3	+	A	P11	P17, P26, P28	6,7	+	A
9	P9, P13, P14, P17, P18, P20, P26, P27	P4, P10, P15, P16, P17, P18, P19, P22, P23, P25, P27, P28, P29, P30	20,0	+	A	P1, P3, P21	P1, P3, P9, P11, P13, P14, P26	13,3	+	A
10	P3, P4, P10, P22, P24, P30	P1, P3, P13, P14, P15, P16, P17, P22, P23, P24, P28, P29	20,0	+	GC	P2, P5, P8, P11, P18, P20	P2, P4, P5, P8, P11, P18, P20, P26, P30	10,0	+	A
11	P3, P4, P8, P9, P12, P14, P15, P16, P21, P22, P23, P24, P28	P3, P9, P10, P12, P14, P20, P23, P25, P26, P27, P28, P29, P30	0,0	0	NA	P1, P2, P5, P6, P7, P11, P13, P17, P18, P19	P1, P2, P4, P5, P6, P7, P8, P11, P13, P16, P17, P18, P19, P21, P22, P24	20,0	+	A
12	P1, P6, P9, P12, P17, P29, P30	P1, P6, P7, P9, P10, P13, P15, P20, P22, P24, P25, P27, P28	20,0	+	A	P5, P8, P11, P18, P21, P23	P5, P8, P11, P18, P21, P24, P29, P30	6,7	+	A
13	P2, P3, P9, P12, P16, P23, P25, P29	P2, P4, P6, P8, P9, P12, P19, P20, P21, P22, P23, P26, P27, P28, P30	23,3	+	A	P1, P4, P5, P14, P15, P24	P1, P3, P5, P14, P15, P24, P25, P29	6,7	+	A
14	P1, P6, P8, P9, P10, P12, P13, P15, P17, P21	P1, P2, P3, P6, P9, P10, P12, P17, P20, P26, P28, P29, P30	10,0	+	A	P4, P7, P11, P18, P19, P23	P4, P7, P8, P11, P13, P15, P18, P19, P21, P23	13,3	+	A
15	P1, P2, P7, P10, P14, P16, P17, P19, P20, P24	P1, P2, P4, P5, P6, P7, P11, P13, P15, P17, P22, P25, P26, P27, P29	16,7	+	A	P9, P30	P9, P18, P19, P24, P30	10,0	+	A
Average			16,7		A			11,8		A

Note: PR= Pupil Reputational; Itp= Interpretation; The symbol of P= Pupil

Table 3 and Table 4 show the vicissitudes that arise for pupils' level conception. The changes that arise expression that for the item, the popular changes that arise are reductions in pupils who knowledge on the Misconception (MC) and No Understanding (NU) category and pupils experienced an increase on the Partial Understanding (PU) and Sound Understanding (SU) category. Though, pupils still experience changes in the category of Misconceptions and Not Understanding even persisting in those categories. The altering trouble of misconception can be spring through misconceptions intensely rooted in the pupils' minds. [36]. Attained outcomes of the popular pupils' changes is Acceptable (A). On the Un-Coddable (UC) category, the code of Q3 is a top percentage which shows a change, and this is No Acceptable (NA) changes category. The top percentage in the Misconception (M) category is number 5 with 26.7%. The misconception change arises on the impulse concept with a momentum change. The top percentage in the No Understanding (NU) category is number 6 with 23.3%. These question is a problem that speeches the impulse concept. The top percentage in the Sound Understanding (SU) category is 16.7% in number 5. The top percentage in the Partial Understanding (PU) category is 26.7% on number 7 and the bottom percentage is 0.0% in number 11 which specified that no change was predictable or No Acceptable (NA) category. The kind of change expressions from the pupils' number changes to the symbol of positive and negative.

The Misconception (M) category has the largest percentage with 19.8%. For changes in the Acceptable (A) category, 16.7% occurred in the Partial Understanding (PU) category,

11.8% occurred in the Sound Understanding (SU) category, and 8.9% occurred in the No Understanding (NU) category. Meanwhile, changes to the No Acceptable (NA) category occur in the Un-Coddable (UC) category. This happens because there are questions that have not been answered by pupils perfectly. But the use of reputational texts through POEAW tasks makes many conception changes experienced by pupils for the better. In this case, the conceptual change experienced by pupils occurs in the concept of momentum-impulse.

In the momentum-impulse concept, generally, the change in the No Acceptable (NA) category occurs from the Misconception (M) category to the Sound Understanding category by 50%. While 3.33% occurred in the change from the Misconception (M) category to the Un-Coddable (UC) category and became the smallest change in the category of conception change. For changes in the No Change (NC) category, 93.3% were in the Partial Understanding (PU) category and were the highest changes. Meanwhile, the No Understanding (NU) category was the lowest category for the No Change (NC) change category. This can be an illustration of the use of POEAW which is able to increase pupils' conceptual changes. These results are consistent with similar research in teaching physics concepts, increasing pupils' understanding of concepts, and minimizing alternative conceptions by using conceptual change text or we now know as reputational text [6], [7], [31], [37]-[40].

4. Conclusion

The reputational texts through POEAW tasks that we have developed have five differences for each stage with the POEAW model. Afterward trying on 30 pupils eleven grade senior high school, we find changes in each conception category at all levels. In the change with the Acceptable (A) category, amounting to 86.7%, the change occurred from the Misconception (M) category to the Partial Understanding (PU) category, and this was the biggest change that occurred. Meanwhile, at 6.7%, the change occurred from the No Understanding (NU) category to the Sound Understanding (SU) category and was the smallest change in the category of conceptual change.

References

- [1] Saglam, A. & Kurnaz, M.A. Prospective Physics Teacher's Level of Understanding Energy, Power and Force Concept. *Asia-Pacific Forum on Science Learning and Teaching*, 10(1), 1-18, (2009).
- [2] Saglam, A. & Devecioglu, Y. Student Teacher's Level of Understanding and Model of Understanding about Newton's Law of Motion. *Asia-Pacific Forum on Science Learning and Teaching*, 9(1), 1-20, (2010).
- [3] Sopandi, W., Latip, A., & Sujana, A. Prospective Primary School Teachers' Understanding on States of Matter and Their Changes. *IOP Conference Series: Journal of Physics*, 812, 1-8, (2017).
- [4] Nurhuda, T., Rusdiana, D., & Setiawan, W. Analyzing Students' Level of Understanding on Kinetic Theory of Gases. *IOP Conference Series: Journal of Physics*, 812, 1-6, (2017).
- [5] Afif, N.F., Nugaraha, M. G., & Samsudin, A. Developing energy and momentum conceptual survey (EMCS) with four-tier diagnostic test items. *AIP Conference Proceedings*, 1848, 1-5, (2017).
- [6] Ozkan, G. The use of conceptual change texts as class material in the teaching of "sound" in physics. *Asia-Pacific Forum on Science Learning and Teaching*, 14(1), 1-22, (2013).
- [7] Ozkan, G., & Selcuk, G. S. Facilitating conceptual change in Students' Understanding of Concepts Related to Pressure. *European Journal of Physics*, 37, 1-20, (2016).
- [8] Darman, D. R., Anriani, N., Wibowo, F. C., Faizin, M. N., Samsudin, A., Suhandi, A., Supriyatman, Suherman, A., Nurhaji, S., Nurtanto, M., Ramdani, S. D., Abizar, H., Fawaid, M., Nulhakim, L., & Siswanto. Effectiveness of learning support of asset (assessment simulation test) for reconstruction physics conception. *Journal of Physics: Conference Series*, 1280(5), 1-8, (2019).

- [9] Sufa, F. F., Gunarhadi, Akhyar, M., & Munawir. Introduce Mathematical Concepts for Early Childhood: Inhibiting and Supporting Factors through Play in Children's Cognitive Stimulation. *International Journal of Psychosocial Rehabilitation*, 24(7), (2020).
- [10] Lai, P. Y., & Chan, K. W. A structural model of conceptions of learning, achievement motivation and learning strategies of Hong Kong teacher education students. *Australian Association of Research in Education Parramatta Conference*, pp. 1-13, (2005).
- [11] Alamdarloo, G.H, Moradi, S. & Dehshiri, G.R. The Relationship between Students' Conceptions of Learning and Their Academic Achievement. *Psychology*, 4(1), (2013), pp. 44-49.
- [12] Afadil, Anang Wahid Muhammad Diah. Conceptual Change of Prospective Chemistry Teachers Through the Implementation of Ps-Trilogi Learning Model on Chemical Kinetics. *International Journal of Advanced Science and Technology*, 29(5s), (2020), pp. 777-783.
- [13] Aktan, D.C. Investigation of students' intermediate conceptual understanding levels: The case of direct current electricity concepts. *European Journal of Physics*, 34, (2013), pp. 33-34.
- [14] Chambers, S.K., & Andre, T. Gender, Prior Knowledge, Interest, and Experience in Electricity and Conceptual Change Text Manipulations in Learning about Direct Current. *Journal of Research in Science Teaching*, 34(1), (1997), pp. 107-123.
- [15] Hammer, D. More than misconceptions: Multiple perspectives on student knowledge and reasoning, and an appropriate role for education research. *American Journal of Physics*, 64(1), (1996), pp. 1316-1325.
- [16] Yalcin, M, Altun, S, Turgut, U, & Aggul F. First Year Turkish Science Undergraduates' Understanding and Misconceptions of Light. *Science & Education*, 18(1), (2008), 1083-1093.
- [17] Wijaya, C.P., Supriyono, K.H., & Muhardjito. The Diagnosis of Senior High School Class X MIA B Students Misconceptions about Hydrostatic Pressure Concept Using Three-Tier. *Jurnal Pendidikan IPA Indonesia*, 5(1), (2016), 14-21.
- [18] Aminudin, A. H., Adimayuda, R., Kaniawati, I., Suhendi, E., Samsudin, A., & Coştu, B. Rasch Analysis of Multitier Open-ended Light-Wave Instrument (MOLWI): Developing and Assessing Second-Years Sundanese-Scholars Alternative Conceptions. *Journal for the Education of Gifted Young Scientists*, 7(3), (2019), pp. 557-579.
- [19] Nurtanto, M., Nurhaji, S., Widjanarko, D., Wijaya, M. B. R., & Sofyan, H. Comparison of Scientific Literacy in Engine Tune-up Competencies through Guided Problem-Based Learning and Non-Integrated Problem-Based Learning in Vocational Education. *Journal of Physics: Conference Series*, 1114(1), 1-7, (2018).
- [20] Headman, H. E. B. E. In-service Teachers' Knowledge and Misconceptions of Global Warming and Ozone Layer Depletion: A Case Study. *Journal for the Education of Gifted Young Scientists*, 8(1), (2020), pp. 133-149.
- [21] Islam, M. S., & Das, J. K. A New Approach: Automatically Identify Naming Word from Bengali Sentence for Machine Translation. *International Journal of Advanced Science and Technology*, 74, (2015), pp. 49-62.
- [22] Susilawati, Kaniawati, I., Ramalis, T. R., Rusdiana, D. Investigating Scientific Reasoning through Observation and Astronomy Practices on Student and Pre-service Physics Teacher. *International Journal of Advanced Science and Technology*, 29(3), 4857-4865.
- [23] Rasulovna, S. M., Aripovna, A. K., Askarovna, U. D., Kamilovna, E. D., & Almasovna, S. N. (2020). The Analysis of the Concept of " Spirituality" and the Emergence of Different Approaches in Dictionaries and Modern Scientific Literature. *International Journal of Psychosocial Rehabilitation*, 24(1), (2020), pp. 320-325.
- [24] Tas, E., Gulen, S., Oner, Z., & Ozyurek, C. The effects of classic and web-designed conceptual change texts on the subject of water chemistry. *International Electronic Journal of Elementary Education*, 7(2), (2015), pp. 263-280.
- [25] Başer, M. Effects of conceptual change and traditional confirmatory simulations on pre-service teachers' understanding of direct current circuits. *Journal of Science Education and Technology*, 15(5), (2006), pp. 367-381.
- [26] Başer, M., & Geban, Ö. Effectiveness of conceptual change instruction on understanding of heat and temperature concepts. *Research in Science and Technological Education*, 25(1), (2007). pp. 115-133.
- [27] Dilber, R., Karaman, I., & Duzgun, B. High school students' understanding of projectile motion concepts. *Educational Research and Evaluation*, 15(3), (2009), pp. 203-222.

- [28] She, H. C. DSLM instructional approach to conceptual change involving thermal expansion. *Research in Science and Technological Education*, 21(1), (2003), pp. 43-54.
- [29] Syuhendri, S. A Learning Process Based on Conceptual Change Approach to Foster Conceptual Change in Newtonian Mechanics. *Journal of Baltic Science Education*, 16(2), (2017), pp. 228-240.
- [30] Turgut, U., & Gurbuz, F. Effect of conceptual change text approach on removal of students' misconceptions about heat and temperature. *Journal Innovation and Learning*, 11(4), (2012), pp. 386-403.
- [31] Yurug, N., & Eroglu, P. The Effect of Conceptual Change Texts Enriched with Metaconceptual Processes on Pre-Service Science Teachers' Conceptual Understanding of Heat and Temperature. *Journal of Baltic Science Education*, 15(6), (2016), pp. 693-705.
- [32] Posner, G.J., Strike, K., Hewson, P. W., & Gertzog, W.A. Accommodation of a scientific conception: Toward a theory of conceptual change. *Science Education*, 66(2), (1982), pp. 211-227.
- [33] Samsudin, A., et al. Alleviating Students' Misconceptions About Newton's First Law Through Comparing Pdeode*e Tasks and Poe Tasks: Which is More Effective? *Turkish Online Journal of Educational Technology, Special Issue for INTE 2017*, (2017), pp. 215-221.
- [34] Fratiwi, N.J. The transformation of two-tier test into four-tier test on Newton's laws concepts. *AIPConference Proceedings*, 1848(1), 1-5, (2017).
- [35] Saputra, O., Setiawan, A., Rusdiana, D., & Muslim. Analysis of Students' Misconception Using Four Tier Diagnostic Test on Fluid Topics. *International Journal of Advanced Science and Technology*, 29(1), (2020), pp. 1256-1266.
- [36] Samsudin, A., Suhandi, A., Rusdiana, D., & Kaniawati, I. Preliminary Design of ICI-based Multimedia for Reconceptualizing Electric Conceptions at Universitas Pendidikan Indonesia. *Journal of Physics: Conference Series*, 739(1), 1-6, (2016).
- [37] Cil, E. Teaching Nature of Science Through Conceptual Change Approach: Conceptual Change Texts and Concept Cartoons. *Journal of Baltic Science Education*, 13(3), (2014), pp. 339-350.
- [38] Ultay, N., Durukan, U.G., & Ultay, E. Evaluation of the effectiveness of conceptual change texts in the REACT strategy. *The Royal Society of Chemistry*, 16, (2015), pp. 22-38.
- [39] Costu, B., Ayas, A. & Niaz, M. Investigating the Effectiveness of a POE-Based Teaching Activity on Students' Understanding of Condensation. *Instructional Science*, 40, (2012), pp. 47-67.
- [40] Ozkan, G., & Selcuk, G. S. The Effectiveness of Conceptual Change Texts and Context-Based Learning on Students' Conceptual Achievement. *Journal of Baltic Science Education*, 14(6), (2015). 753-763.
- [41] Z. Arifin, M. Nurtanto, W. Warju, R. Rabiman, and N. Kholifah, 'The TAWOCK Conceptual Model for Content Knowledge for Professional Teaching in Vocational Education', *Int. J. Eval. Res. Educ.*, vol. 9, no. 3, (2020).
- [42] M. Nurtanto, P. Pardjono, Widarto -, and S. D. Ramdani, 'The Effect of STEM-EDP in Professional Learning on Automotive Engineering Competence in Vocational High School', *J. Educ. Gift. Young Sci.*, vol. 8, no. 2, (2020), pp. 633-656.
- [43] R. Rabiman, M. Nurtanto, and N. Kholifah, 'Design and Development E-Learning System by Learning Management System (LMS) in Vocational Education', vol. 9, no. 1, pp. 1059-1063, (2020).
- [44] Nurtanto, M., Sofyan, H., Fawaid, M., & Rabiman, R. (2019). Problem-Based Learning (PBL) in Industry 4.0: Improving learning quality through character-based literacy learning and life career skill (LL-LCS). *Universal Journal of Educational Research*, 7(11), 2487-2494.