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The Effect of Local Wisdom-Based Comic Media On Students' Coral Reef Conceptual Understanding Viewed From Gender

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Abstract. This study aims to reveal the effectiveness of local wisdom-oriented comic media in expressing students' conceptual understanding of different genders. This research was a quasi-experimental study that adopted a separate sample pretest-posttest design. The subjects of this study were junior high school students from two different regions in West Nusa Tenggara Province, namely SMPN 2 Gangga, North Lombok and SMPN 2 Batukliang, Central Lombok. Schools were taken randomly with a total number of 48 students as samples. The students' conceptual understanding was collected through tests and analyzed using the formulas of N-gain, N-Loss, and independent-sample t-test to determine the effectiveness of comic media. The results showed that the implementation of comic media had a positive impact and could increase students' conceptual understanding of coral reef. More specifically, female students were likely to have smaller N-loss scores than male students and have a better conceptual understanding than male students ($p < .05$).

Keywords: Comic media, conceptual understanding, gender.

INTRODUCTION

The coral reef is one of the superior natural resources owned by Indonesia [1]. Coral reef ecosystems have high biodiversity [2] and have ecological, socio-economic and cultural functions that are very important for the community [3]. In Indonesia, the existence of coral reef ecosystem has a very strong socioeconomic function because it is the foundation of life for the local community. Unfortunately, damage to the coral reef ecosystem in Indonesia continues. The latest report reveals that 35.15% of coral reef ecosystems in Indonesia are in a bad category, 35.06% are in the quite good category, 23.04% are in a good category, and the rest are only 6.39% in the very good category [4]. Some areas even have severely damaged coral reef ecosystems as in West Nusa Tenggara Province (NTB). Setiawan et al [5] found that 50% of coral reefs on Gili Matra, NTB have experienced bleaching, further Aulia et al [6] revealed that of the 105 locations observed for coral reef damage in NTB, 58 locations had the worst damage.

Damage to the coral reef ecosystem occurred in Indonesia needs to be addressed, because coral reefs are a national asset that needs to be preserved [7]. One of the efforts to conserve coral reefs can be done through the integration of coral reef material into the school curriculum in Indonesia [8]. This is intended to increase students' conceptual understanding of coral reefs so that students' awareness and conservation attitudes towards coral reefs become better. The integration of coral reef material into the curriculum is implemented in the form of teaching materials that contain enrichment material about coral reefs [9]. Further research conducted by Sukri et al [10] revealed that to teach coral reef ecosystems to students, it can be done through the preparation of coral reef comic as

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teaching materials. The packaging of coral reef ecosystem material into the comic as media is done so that the material can be easily understood by students because it uses simple language [11], attractive with a good source of images [12], as well as in accordance by the cognitive level of students.

Knowing and revealing students' understanding of coral reefs is necessary. The research was a pilot study that examined the level of students' understanding who were taught using coral reef comic as learning media at the level of secondary school students in Indonesia. The results of this study would reveal whether the subject material of coral reef ecosystems packaged into the comic as media was effectively used for learning in schools. The results of previous studies conducted by several researchers revealed that the implementation of comic as learning media can improve students' reading comprehension [13], improve students' critical thinking skills and competencies [14], can be used as an effective medium of English learning to improve students' vocabulary skills [15], and can be used as an effective tool in teaching integrated science [16]. The weakness of the research was that it had not revealed whether the comic media was effective to be used for teaching students of different genders.

The novelty of this study lies in the comic media designed in the form of local wisdom to manage and preserve the coral reef ecosystems at West Nusa Tenggara (NTB), Indonesia. One of the local wisdom forms created to maintain the coral reef ecosystems was 'Awig-Awig', which is a social agreement that is enacted together to figure out the relationship among societies, between the society and nature, and between the society and the creator. The Awig-awig, which regulates the management and utilization of marine plant resources such as coral reef ecosystems, has been implemented in several areas such as in Gili Indah, Batu Nampar, East Lombok and other places in NTB province. This local wisdom-based management model was inserted in the comic media to provide students' understanding and awareness to maintain the coral reef ecosystem. The purpose of this study is to reveal the effectiveness of the local wisdom-oriented comic media to find out the students' conceptual understanding of coral reefs in different genders. The results of implementing the local wisdom-oriented comic media were described in this article.

RESEARCH METHOD

This study adopted a separate sample pretest-posttest design [17]. Two sample schools were drawn from West Nusa Tenggara Province, namely SMPN 2 Gangga, North Lombok and SMPN 2 Batukliang, Central Lombok. The school was randomly selected with a total number of sample as many as 48 students consisting of 29 female students and 19 male students. Both experimental classes were given treatment using coral reef comic media. The pre-test was given before using comic media, while the post-test was given after using comic media. Research activities carried out in the even semester of the academic year of 2018/2019.

Data on students' conceptual understanding were collected using concept comprehension tests that had been tested for validity and reliability [18]. Test scores are in the range of 0-100. To find out the effectiveness of using comic media on students' conceptual understanding, an N-gain analysis [19] was compared with an N-loss value [20]. N-gain values are categorized into three levels, namely high ($g \geq 0.7$), moderate ($0.7 > g \geq 0.3$), and low ($g < 0.3$). To find out differences in students' conceptual understanding based on different genders, an independent sample t-test was used [21][22]. Statistical analysis was assisted by IBM SPSS software for windows [23].

RESULT AND DISCUSSION

To determine the effectiveness of local wisdom oriented comic media on students' conceptual understanding, an N-gain analysis was performed for each school based on different gender. The following shows the results of the N-gain analysis in different schools and genders (Table 1).

TABLE 1. N-gain analysis results for each experimental school

School	Gender	Gain (g)	Category
SMPN 2 Batukliang	Male	0.53	Moderate
	Female	0.44	Moderate
SMPN 2 Gangga	Male	0.45	Moderate
	Female	0.85	High

The results of the N-gain analysis in Table 1 show that the value of N-gain of the students' conceptual understanding in SMPN 2 Batukliang, both male and female students are in the medium category. While for SMPN 2 Gangga there are differences in the N-gain values for male and female students where the N-gain value for female students is higher than N-gain value for male students, namely high and medium categories. The N-gain values in the medium and high categories indicate that there is an effect of the implementation of coral reef comic media on the students' conceptual understanding, both male and female. To strengthen this assumption, N-loss (Normalized loss) analysis is needed to determine whether there is a student retention factor that occurs in the transition process [24]. N-loss is interpreted as the possibility of changing correct answers at pretest, and being wrong at posttest [20][25]. If $L > 0$, then loss occurs and vice versa if $L < 0$, then there is no loss in students [25]. The results of the transition analysis of students' answers during the pretest and posttest are presented in Table 2, while the proportions of the gain (g) and loss (L) are shown in Table 3.

TABLE 2. Transition percentage of students' responses for each school

School	Transition	Percentage (%)
SMPN 2	RR (right to right)	44
	RW (right to wrong)	7
Gangga	WW (wrong to wrong)	15
	WR (wrong to right)	34
SMPN 2	RR (right to right)	31
	RW (right to wrong)	10
Batukliang	WW (wrong to wrong)	25
	WR (wrong to right)	35

TABLE 3. Comparison of gain (g) and loss (L) values in each gender

School	Gender	RW transition (%)	Gain (g)	Loss (L)
SMPN 2	Male	10	0.53	0.25
Batukliang	Female	9	0.44	0.25
SMPN 2	Male	10	0.45	0.27
Gangga	Female	3	0.85	0.07

To strengthen the results obtained, it is necessary to analyze the learning outcomes of different gender students shown in Table 4.

TABLE 4. Differences in conceptual understanding of male and female students

Variable	Gender	N	Mean	Std. Dev	Std. Error Diff	Df	Sig (2 tailed)
Conceptual Understanding	Male	19	52.37	9.63	3.95	46	.007
	Female	29	63.62	15.31	3.60		

The results of the analysis in Table 2 show that there is a transition of changes in students' answers in the two observation schools. This result is quite surprising because the percentage of RWs in student answers is not equal to zero which indicates that there has been a loss that affects the value of the N-gain (Table 3). However, the results of the analysis in Table 3 also reveal that the values of N-gain are greater than L ($N\text{-gain} > L$) in each gender which indicates that there is an effect of the intervention given and the interaction process that is able to introduce students to learn and correct their mistakes in the learning process [24]. This result also revealed that the percentage of RWs in male students tended to be greater than that of female students and the loss in male students was greater than in female students. This tendency may be caused by several things such as better retention power in females than males [26] so that they can easily answer posttest questions that have the same form as pre-test questions given previously; or perhaps it is caused by the problem-solving ability of women which is better than that of males because female students have the ability to solve problems correctly and carefully and check on the answers that they have completed [27]. This is supported by several studies that show that critical thinking skills in females are higher than in males [28] and the average creativity of female students is better than in male students [29].

The results of the analysis in Table 4 show that there is an indirect correlation between the magnitude of the L value with the students' conceptual understanding variable. Female students have a smaller L value and have a higher average conceptual understanding than male students ($p = .007 < .05$), and vice versa. These results reinforce the previous assumption that interventions given to students in the form of coral reef comics can improve students'

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conceptual understanding of coral reef. Understanding this concept is affected by the transition of student answers. Bao [30] states that the transition process will affect students' conceptual understanding due to an intervention. Bao [30] further explained that this transition process occurs in three types, namely type- α , type- β , and type- γ . Type- α transition reflects the direct effect of learning on changes in students' wrong answers, β -type transition reflects the direct effect of learning on students' right knowledge, and type- γ transitions reflect the process of internal interactions between right and wrong knowledge. These three types of transitions can be seen in Table 2. Overall, the results obtained indicate that the interventions provided have a positive effect on students.

CONCLUSION

The implementation of comic media for junior high school students has a positive impact and can improve students' conceptual understanding of coral reef. More specifically, female students tend to have smaller N-loss scores and have a better conceptual understanding than male students.

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RESULT AND DISCUSSION

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	WW (wrong to wrong)	15
	WR (wrong to right)	34
SMPN 2 Batukliang	RR (right to right)	31
	RW (right to wrong)	10
	WW (wrong to wrong)	25
	WR (wrong to right)	35

TABLE 3. Comparison of gain (g) and loss (L) values in each gender

School	Gender	RW transition (%)	Gain (g)	Loss (L)
SMPN 2	Male	10	0.53	0.25
Batukliang	Female	9	0.44	0.25
SMPN 2	Male	10	0.45	0.27
Gangga	Female	3	0.85	0.07

To strengthen the results obtained, it is necessary to analyze the learning outcomes of different gender students shown in Table 4.

TABLE 4. Differences in conceptual understanding of male and female students

Variable	Gender	N	Mean	Std. Dev	Std. Error Diff	Df	Sig (2 tailed)
Conceptual Understanding	Male	19	52.37	9.63	3.95	46	.007
	Female	29	63.62	15.31	3.60		

The results of the analysis in Table 2 show that there is a transition of changes in students' answers in the two observation schools. This result is quite surprising because the percentage of RWs in student answers is not equal to zero which indicates that there has been a loss that affects the value of the N-gain (Table 3). However, the results of the analysis in Table 3 also reveal that the values of N-gain are greater than L ($N\text{-gain} > L$) in each gender which indicates that there is an effect of the intervention given and the interaction process that is able to introduce students to learn and correct their mistakes in the learning process [24]. This result also revealed that the percentage of RWs in male students tended to be greater than that of female students and the loss in male students was greater than in female students. This tendency may be caused by several things such as better retention power in females than males [26] so that they can easily answer posttest questions that have the same form as pre-test questions given previously; or perhaps it is caused by the problem-solving ability of women which is better than that of males because female students have the ability to solve problems correctly and carefully and check on the answers that they have completed [27]. This is supported by several studies that show that critical thinking skills in females are higher than in males [28] and the average creativity of female students is better than in male students [29].

The results of the analysis in Table 4 show that there is an indirect correlation between the magnitude of the L value with the students' conceptual understanding variable. Female students have a smaller L value and have a higher average conceptual understanding than male students ($p = .007 < .05$), and vice versa. These results reinforce the previous assumption that interventions given to students in the form of coral reef comics can improve students'

conceptual understanding of coral reef. Understanding this concept is affected by the transition of student answers. Bao [30] states that the transition process will affect students' conceptual understanding due to an intervention. Bao [30] further explained that this transition process occurs in three types, namely type- α , type- β , and type- γ . Type- α transition reflects the direct effect of learning on changes in students' wrong answers, β -type transition reflects the direct effect of learning on students' right knowledge, and type- γ transitions reflect the process of internal interactions between right and wrong knowledge. These three types of transitions can be seen in Table 2. Overall, the results obtained indicate that the interventions provided have a positive effect on students.

CONCLUSION

The implementation of comic media for junior high school students has a positive impact and can improve students' conceptual understanding of coral reefs. More specifically, female students tend to have smaller N-loss scores and have a better conceptual understanding than male students.

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The Effect of Local Wisdom-Based Comic Media On Students' Coral Reef Conceptual Understanding Viewed From Gender

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Abstract. This study aims to reveal the effectiveness of local wisdom-oriented comic media in expressing students' conceptual understanding of different genders. This research was a quasi-experimental study that adopted a separate sample pretest-posttest design. The subjects of this study were junior high school students from two different regions in West Nusa Tenggara Province, namely SMPN 2 Gangga, North Lombok, and SMPN 2 Batukliang, Central Lombok. Schools were taken randomly with a total number of 48 students as samples. The students' conceptual understanding was collected through tests and analyzed using the N-gain, N-Loss, and independent-sample t-test to determine the effectiveness of comic media. The results showed that the implementation of comic media had a positive impact and could increase students' conceptual understanding of coral reefs. More specifically, female students were likely to have lower N-loss scores than male students and better conceptual understanding than male students ($p < .05$).

Keywords: Comic media, conceptual understanding, gender.

INTRODUCTION

The coral reef is one of the superior natural resources owned by Indonesia [1]. Coral reef ecosystems have high biodiversity [2] and have ecological, socio-economic, and cultural functions that are very important for the community [3]. In Indonesia, the existence of the coral reef ecosystem has a powerful socio-economic function because it is the foundation of life for the local community. Unfortunately, damage to the coral reef ecosystem in Indonesia continues. The latest report reveals that 35.15% of coral reef ecosystems in Indonesia are in a bad category, 35.06% are in the quite good category, 23.04% are in a good category, and the rest are only 6.39% in the very good category [4]. Some areas have severely damaged coral reef ecosystems, such as West Nusa Tenggara Province (NTB). Setiawan et al.[5] found that 50% of coral reefs on Gili Matra, NTB has experienced bleaching. Aulia et al.[6] revealed that of the 105 locations observed for coral reefs damaged in NTB, 58 locations had the worst damage.

Damage to the coral reef ecosystem in Indonesia needs to be addressed because coral reefs are a national asset that needs to be preserved [7]. One of the efforts to conserve coral reefs can be made through the integration of coral reef material into the school curriculum in Indonesia [8]. This is intended to increase students' conceptual understanding of coral reefs so that students' awareness and conservation attitudes towards coral reefs become better. The integration of coral reef material into the curriculum is implemented in teaching materials containing enrichment material about coral reefs [9]. Further research conducted by Sukri et al.[10] revealed that teaching coral reef ecosystems to students can be done through the preparation of coral reef comics as teaching materials. The packaging of coral reef ecosystem material into the comic as media is done so that students can easily understand the

material because it uses simple language [11], attractive with a good source of images [12], as well as in accordance with the cognitive level of students.

Knowing and revealing students' understanding of coral reefs is necessary. The research was a pilot study that examined the level of students' understanding who were taught using coral reef comics as learning media at the level of secondary school students in Indonesia. The results of this study would reveal whether the subject material of coral reef ecosystems packaged into the comic as media was effectively used for learning in schools. The results of previous studies conducted by several researchers revealed that the implementation of comic as learning media can improve students' reading comprehension [13], improve students' critical thinking skills and competencies [14], can be used as an effective medium of English learning to improve students' vocabulary skills [15], and can be used as an effective tool in teaching integrated science [16]. The weakness of the research was that it had not revealed whether the comic media was effective to be used for teaching students of different genders.

The novelty of this study lies in the comic media designed in the form of local wisdom to manage and preserve the coral reef ecosystems at West Nusa Tenggara (NTB), Indonesia. One of the local wisdom forms created to maintain the coral reef ecosystems was 'Awig-Awig', which is a social agreement that is enacted together to figure out the relationship among societies, between the society and nature, and between the society and the creator. The Awig-awig, which regulates the management and utilization of marine plant resources such as coral reef ecosystems, has been implemented in several areas such as in Gili Indah, Batu Nampar, East Lombok and other places in NTB province. This local wisdom-based management model was inserted in the comics media to provide students' understanding and awareness to maintain the coral reef ecosystem. This study aims to reveal the effectiveness of the local wisdom-oriented comics media to find out the students' conceptual understanding of coral reefs in different genders. The results of implementing the local wisdom-oriented comic media were described in this article.

RESEARCH METHOD

This study adopted a separate sample pretest-posttest design [17]. Two sample schools were drawn from West Nusa Tenggara Province, namely SMPN 2 Gangga, North Lombok and SMPN 2 Batukliang, Central Lombok. The school was randomly selected with a total number of samples as many as 48 students consisting of 29 female students and 19 male students. Both experimental classes were given treatment using coral reef comic media. The pretest was given before using comic media, while the posttest was given after using comic media. Research activities were carried out in the even semester of the academic year of 2018/2019.

Data on students' conceptual understanding were collected using concept comprehension tests that had been tested for validity and reliability [18]. Test scores are in the range of 0-100. To find out the effectiveness of using comic media on students' conceptual understanding, an N-gain analysis [19] was compared with an N-loss value [20]. N-gain values are categorized into three levels, namely high ($g \geq 0.7$), moderate ($0.7 > g \geq 0.3$), and low ($g < 0.3$). To find out differences in students' conceptual understanding based on different genders, an independent sample t-test was used [21][22]. Statistical analysis was assisted by IBM SPSS software for windows [23].

RESULT AND DISCUSSION

To determine the effectiveness of local wisdom-oriented comic media on students' conceptual understanding, an N-gain analysis was performed for each school based on different gender. The following shows the results of the N-gain analysis in different schools and genders (Table 1).

TABLE 1. N-gain analysis results for each experimental school

School	Gender	Gain (g)	Category
SMPN 2 Batukliang	Male	0.53	Moderate
	Female	0.44	Moderate
SMPN 2 Gangga	Male	0.45	Moderate
	Female	0.85	High

The results of the N-gain analysis in Table 1 show that the value of N-gain of the students' conceptual understanding in SMPN 2 Batukliang, both male and female students are in the medium category. While for SMPN 2 Gangga there are differences in the N-gain values for male and female students where the N-gain value for female

students is higher than the N-gain value for male students, namely high and medium categories. The N-gain values in the medium and high categories indicate that there is an effect of the implementation of coral reef comic media on the students' conceptual understanding, both male and female. To strengthen this assumption, N-loss (Normalized loss) analysis is needed to determine whether there is a student retention factor that occurs in the transition process [24]. N-loss is interpreted as the possibility of changing correct answers at pretest and being wrong at posttest [20][25]. If $L > 0$, then loss occurs, and vice versa if $L < 0$, then there is no loss in students [25]. The results of the transition analysis of students' answers during the pretest and posttest are presented in Table 2, while the proportions of the gain (g) and loss (L) are shown in Table 3.

TABLE 2. Transition percentage of students' responses for each school

School	Transition	Percentage (%)
SMPN 2 Gangga	RR (right to right)	44
	RW (right to wrong)	7
	WW (wrong to wrong)	15
SMPN 2 Batukliang	WR (wrong to right)	34
	RR (right to right)	31
	RW (right to wrong)	10
	WW (wrong to wrong)	25
	WR (wrong to right)	35

TABLE 3. Comparison of gain (g) and loss (L) values in each gender

School	Gender	RW transition (%)	Gain (g)	Loss (L)
SMPN 2	Male	10	0.53	0.25
Batukliang	Female	9	0.44	0.25
SMPN 2	Male	10	0.45	0.27
Gangga	Female	3	0.85	0.07

To strengthen the results obtained, it is necessary to analyze the learning outcomes of different gender students shown in Table 4.

TABLE 4. Differences in conceptual understanding of male and female students

Variable	Gender	N	Mean	Std. Dev	Std. Error Diff	Df	Sig (2 tailed)
Conceptual Understanding	Male	19	52.37	9.63	3.95	46	.007
	Female	29	63.62	15.31			

The results of the analysis in Table 2 show a transition of changes in students' answers in the two observation schools. This result is quite surprising because the percentage of RWs in student answers is not equal to zero, which indicates that there has been a loss that affects the value of the N-gain (Table 3). However, the results of the analysis in Table 3 also reveal that the values of N-gain are greater than L ($N\text{-gain} > L$) in each gender, which indicates that there is an effect of the intervention given and the interaction process that is able to introduce students to learn and correct their mistakes in the learning process [24]. This result also revealed that the percentage of RWs in male students tended to be greater than that of female students, and the loss in male students was greater than in female students. This tendency may be caused by several things such as better retention power in females than males [26] so that they can easily answer posttest questions that have the same form as pretest questions given previously, or perhaps it is caused by the problem-solving ability of women which is better than that of males because female students have the ability to solve problems correctly and carefully and check on the answers that they have completed [27]. This is supported by several studies that show that critical thinking skills in females are higher than in males [28], and the average creativity of female students is better than in male students [29].

The results of the analysis in Table 4 show an indirect correlation between the magnitude of the L value with the students' conceptual understanding variable. Female students have a smaller L value and have a higher average conceptual understanding than male students ($p = .007 < .05$), and vice versa. These results reinforce the previous assumption that interventions given to students in the form of coral reef comics can improve students' conceptual understanding of coral reef. Understanding this concept is affected by the transition of student answers. Bao [30] states that the transition process will affect students' conceptual understanding due to an intervention. Bao [30] further explained that this transition process occurs in three types, namely type- α , type- β , and type- γ . Type- α

transition reflects the direct effect of learning on changes in students' wrong answers, β -type transition reflects the direct effect of learning on students' right knowledge, and type-Y transitions reflect the process of internal interactions between right and wrong knowledge. These three types of transitions can be seen in Table 2. Overall, the results obtained indicate that the interventions provided positively affect students.

CONCLUSION

The implementation of comic media for junior high school students has a positive impact and can improve students' conceptual understanding of coral reefs. More specifically, female students tend to have smaller N-loss scores and have a better conceptual understanding than male students.

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The Effect of Local Wisdom-Based Comic Media On Students' Coral Reef Conceptual Understanding Viewed From Gender

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Abstract. This study aims to reveal the effectiveness of local wisdom-oriented comic media in expressing students' conceptual understanding of different genders. This research was a quasi-experimental study that adopted a separate sample pretest-posttest design. The subjects of this study were junior high school students from two different regions in West Nusa Tenggara Province, namely SMPN 2 Gangga, North Lombok, and SMPN 2 Batukliang, Central Lombok. Schools were taken randomly with a total number of 48 students as samples. The students' conceptual understanding was collected through tests and analyzed using the N-gain, N-Loss, and independent-sample t-test to determine the effectiveness of comic media. The results showed that the implementation of comic media had a positive impact and could increase students' conceptual understanding of coral reefs. More specifically, female students were likely to have lower N-loss scores than male students and better conceptual understanding than male students ($p < .05$).

INTRODUCTION

The coral reef is one of the superior natural resources owned by Indonesia [1]. Coral reef ecosystems have high biodiversity [2] and have ecological, socio-economic, and cultural functions that are very important for the community [3]. In Indonesia, the existence of the coral reef ecosystem has a powerful socio-economic function because it is the foundation of life for the local community. Unfortunately, damage to the coral reef ecosystem in Indonesia continues. The latest report reveals that 35.15% of coral reef ecosystems in Indonesia are in a bad category, 35.06% are in the quite good category, 23.04% are in a good category, and the rest are only 6.39% in the very good category [4]. Some areas have severely damaged coral reef ecosystems, such as West Nusa Tenggara Province (NTB). 50% of coral reefs on Gili Matra, NTB has experienced bleaching. Of the 105 locations observed for coral reefs damaged in NTB, 58 locations had the worst damage [6].

Damage to the coral reef ecosystem in Indonesia needs to be addressed because coral reefs are a national asset that needs to be preserved [7]. One of the efforts to conserve coral reefs can be made through the integration of coral reef material into the school curriculum in Indonesia [8]. This is intended to increase students' conceptual understanding of coral reefs so that students' awareness and conservation attitudes towards coral reefs become better. The integration of coral reef material into the curriculum is implemented in teaching materials containing enrichment material about coral reefs [9]. Teaching coral reef ecosystems to students can be done through the preparation of coral reef comics as teaching materials [10]. The packaging of coral reef ecosystem material into the comic as media is done so that students can easily understand the material because it uses simple language [11], attractive with a good source of images [12], as well as in accordance with the cognitive level of students.

Knowing and revealing students' understanding of coral reefs is necessary. The research was a pilot study that examined the level of students' understanding who were taught using coral reef comics as learning media at the level of secondary school students in Indonesia. The results of this study would reveal whether the subject material of coral reef ecosystems packaged into the comic as media was effectively used for learning in schools. The results of previous studies conducted by several researchers revealed that the implementation of comic as learning media can improve students' reading comprehension [13], improve students' critical thinking skills and competencies [14], can be used as an effective medium of English learning to improve students' vocabulary skills [15], and can be used as an effective tool in teaching integrated science [16]. The weakness of the research was that it had not revealed whether the comic media was effective to be used for teaching students of different genders.

The novelty of this study lies in the comic media designed in the form of local wisdom to manage and preserve the coral reef ecosystems at West Nusa Tenggara (NTB), Indonesia. One of the local wisdom forms created to maintain the coral reef ecosystems was 'Awig-Awig', which is a social agreement that is enacted together to figure out the relationship among societies, between the society and nature, and between the society and the creator. The Awig-awig, which regulates the management and utilization of marine plant resources such as coral reef ecosystems, has been implemented in several areas such as in Gili Indah, Batu Nampar, East Lombok and other places in NTB province. This local wisdom-based management model was inserted in the comics media to provide students' understanding and awareness to maintain the coral reef ecosystem. This study aims to reveal the effectiveness of the local wisdom-oriented comics media to find out the students' conceptual understanding of coral reefs in different genders. The results of implementing the local wisdom-oriented comic media were described in this article.

RESEARCH METHOD

This study adopted a separate sample pretest-posttest design [17]. Two sample schools were drawn from West Nusa Tenggara Province, namely SMPN 2 Gangga, North Lombok and SMPN 2 Batukliang, Central Lombok. The school was randomly selected with a total number of samples as many as 48 students consisting of 29 female students and 19 male students. Both experimental classes were given treatment using coral reef comic media. The pretest was given before using comic media, while the posttest was given after using comic media. Research activities were carried out in the even semester of the academic year of 2018/2019.

Data on students' conceptual understanding were collected using concept comprehension tests that had been tested for validity and reliability [18]. Test scores are in the range of 0-100. To find out the effectiveness of using comic media on students' conceptual understanding, an N-gain analysis [19] was compared with an N-loss value [20]. N-gain values are categorized into three levels, namely high ($g \geq 0.7$), moderate ($0.7 > g \geq 0.3$), and low ($g < 0.3$). To find out differences in students' conceptual understanding based on different genders, an independent sample t-test was used [21][22]. Statistical analysis was assisted by IBM SPSS software for windows [23].

RESULT AND DISCUSSION

To determine the effectiveness of local wisdom-oriented comic media on students' conceptual understanding, an N-gain analysis was performed for each school based on different gender. The following shows the results of the N-gain analysis in different schools and genders (Table 1).

TABLE 1. N-gain analysis results for each experimental school

School	Gender	Gain (g)	Category
SMPN 2 Batukliang	Male	0.53	Moderate
	Female	0.44	Moderate
SMPN 2 Gangga	Male	0.45	Moderate
	Female	0.85	High

The results of the N-gain analysis in Table 1 show that the value of N-gain of the students' conceptual understanding in SMPN 2 Batukliang, both male and female students are in the medium category. While for SMPN 2 Gangga there are differences in the N-gain values for male and female students where the N-gain value for female students is higher than the N-gain value for male students, namely high and medium categories. The N-gain values in the medium and high categories indicate that there is an effect of the implementation of coral reef comic media on the students' conceptual understanding, both male and female. To strengthen this assumption, N-loss (Normalized loss) analysis is needed to determine whether there is a student retention factor that occurs in the transition process [24]. N-

loss is interpreted as the possibility of changing correct answers at pretest and being wrong at posttest [20][25]. If $L > 0$, then loss occurs, and vice versa if $L < 0$, then there is no loss in students [25]. The results of the transition analysis of students' answers during the pretest and posttest are presented in Table 2, while the proportions of the gain (g) and loss (L) are shown in Table 3.

TABLE 2. Transition percentage of students' responses for each school

School	Transition	Percentage (%)
SMPN 2 Gangga	RR (right to right)	44
	RW (right to wrong)	7
	WW (wrong to wrong)	15
SMPN 2 Batukliang	WR (wrong to right)	34
	RR (right to right)	31
	RW (right to wrong)	10
Batukliang	WW (wrong to wrong)	25
	WR (wrong to right)	35

TABLE 3. Comparison of gain (g) and loss (L) values in each gender

School	Gender	RW transition (%)	Gain (g)	Loss (L)
SMPN 2	Male	10	0.53	0.25
Batukliang	Female	9	0.44	0.25
SMPN 2	Male	10	0.45	0.27
Gangga	Female	3	0.85	0.07

To strengthen the results obtained, it is necessary to analyze the learning outcomes of different gender students shown in Table 4.

TABLE 4. Differences in conceptual understanding of male and female students

Variable	Gender	N	Mean	Std. Dev	Std. Error Diff	Df	Sig (2 tailed)
Conceptual Understanding	Male	19	52.37	9.63	3.95	46	.007
	Female	29	63.62	15.31	3.60		

The results of the analysis in Table 2 show a transition of changes in students' answers in the two observation schools. This result is quite surprising because the percentage of RWs in student answers is not equal to zero, which indicates that there has been a loss that affects the value of the N-gain (Table 3). However, the results of the analysis in Table 3 also reveal that the values of N-gain are greater than L ($N\text{-gain} > L$) in each gender, which indicates that there is an effect of the intervention given and the interaction process that is able to introduce students to learn and correct their mistakes in the learning process [24]. This result also revealed that the percentage of RWs in male students tended to be greater than that of female students, and the loss in male students was greater than in female students. This tendency may be caused by several things such as better retention power in females than males [26] so that they can easily answer posttest questions that have the same form as pretest questions given previously, or perhaps it is caused by the problem-solving ability of women which is better than that of males because female students have the ability to solve problems correctly and carefully and check on the answers that they have completed [27]. This is supported by several studies that show that critical thinking skills in females are higher than in males [28], and the average creativity of female students is better than in male students [29].

The results of the analysis in Table 4 show an indirect correlation between the magnitude of the L value with the students' conceptual understanding variable. Female students have a smaller L value and have a higher average conceptual understanding than male students ($p = .007 < .05$), and vice versa. These results reinforce the previous assumption that interventions given to students in the form of coral reef comics can improve students' conceptual understanding of coral reef. Understanding this concept is affected by the transition of student answers. Bao [30] states that the transition process will affect students' conceptual understanding due to an intervention. Bao [30] further explained that this transition process occurs in three types, namely type- α , type- β , and type- γ . Type- α transition reflects the direct effect of learning on changes in students' wrong answers, β -type transition reflects the direct effect of learning on students' right knowledge, and type- γ transitions reflect the process of internal interactions between right and wrong knowledge. These three types of transitions can be seen in table 2. Overall, the results obtained indicate that the interventions provided positively affect students.

CONCLUSION

The implementation of comic media for junior high school students has a positive impact and can improve students' conceptual understanding of coral reefs. More specifically, female students tend to have smaller N-loss scores and have a better conceptual understanding than male students.

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