



Review a Manuscript

3 pesan

<iji@ogu.edu.tr>

Sab, 10 Nov 2018 pukul 20.48

Kepada: anasufibanawi@student.upi.edu

Dear Anasufi Banawi,

Subject:

"Effects of Instructional Models and Spatial Intelligence on the Mathematics Learning Outcomes after Controlling Students' Initial Competence"

We have identified you as one of the most suitable people world-wide to review the above manuscript. We hope that you will find this manuscript of interest. If you want we can send you a review certificate. Thank you very much for your consideration and contributions.

Please could you confirm the receipt of this e-mail?

*Note: If it is possible, could you please send your report *within* two weeks?*

Sincerely yours,

Editorial

International Journal of Instruction

International Journal of Instruction

<http://www.e-iji.net>

-

anasufi banawi <anasufibanawi@student.upi.edu>

Min, 11 Nov 2018 pukul 21.26

Kepada: iji@ogu.edu.tr

Dear IJI editor,

Thank you very much for your information.

Through this email I am ready to review the above manuscript.

Thank you very much for your attention.

Sincerely your,

Anasufi Banawi

[Kutipan teks disembunyikan]

anasufi banawi <anasufibanawi@student.upi.edu>

Sab, 17 Nov 2018 pukul 10.21

Kepada: iji@ogu.edu.tr

[Kutipan teks disembunyikan]



International Journal of Instruction Article Evaluation Form

Mr. /Mrs. Anasufi Banawi

It is to acknowledge you that the Executive Committee of *International Journal of Instruction* has decided that the article mentioned below would be reviewed by you. Thank you very much for your contributions.

Asim ARI
Editor in Chief

Name of the article: Effects of Instructional Models and Spatial Intelligence on the Mathematics Learning Outcomes after Controlling Students' Initial Competence

After reviewing the attached article, please read each item carefully and select the response that best reflects your opinion. To register your response, please **mark** or **type in** the appropriate block.

	Yes	Partially	No
Do you think the title is appropriate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does the abstract summarize the article clearly and effectively?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the objectives set clearly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the issue stated clearly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the literature review adequate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the design of the research appropriate, and the exemplary, if any, suitable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the methodology consistent with the practice?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the findings expressed clearly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the presentation of the findings adequate and consistent?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the tables, if any, arranged well?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the conclusions and generalizations based on the findings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the suggestions meaningful, valid, and based on the findings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the references adequate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the language clear and understandable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is cohesion achieved throughout the article?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the work contributing to the field?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Evaluation:**
- The article can be published as it is.
 - The article can be published after some revision.
 - The article must undergo a major revision before it can be resubmitted to the journal.
 - The article cannot be published.

Would you like to see the revised article if you have suggested any revisions? Yes No

Please write your report either on the this paper or on a spare paper.

REPORT





International Journal of Instruction Article Evaluation Form

Mr. /Mrs. Anasufi Banawi

It is to acknowledge you that the Executive Committee of *International Journal of Instruction* has decided that the article mentioned below would be reviewed by you. Thank you very much for your contributions.

March 22, 2019

Asim ARI

Editor in Chief

Name of the article: Effects of Instructional Models and Spatial Intelligence on the Mathematics Learning Outcomes after Controlling Students' Initial Competence

After reviewing the attached article, please read each item carefully and select the response that best reflects your opinion. To register your response, please **mark** or **type in** the appropriate block.

	Yes	Partially	No
Do you think the title is appropriate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does the abstract summarize the article clearly and effectively?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the objectives set clearly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the issue stated clearly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the literature review adequate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the design of the research appropriate, and the exemplary, if any, suitable?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the methodology consistent with the practice?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the findings expressed clearly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the presentation of the findings adequate and consistent?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the tables, if any, arranged well?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are the conclusions and generalizations based on the findings?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the suggestions meaningful, valid, and based on the findings?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the references adequate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the language clear and understandable?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is cohesion achieved throughout the article?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is the work contributing to the field?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

- Evaluation:**
- The article can be published as it is.
 - The article can be published after some revision.
 - The article must undergo a major revision before it can be resubmitted to the journal.
 - The article cannot be published.

Would you like to see the revised article if you have suggested any revisions? Yes No

Please write your report either on the this paper or on a spare paper.

REPORT

1. The benefits of this research need to be briefly described in the introduction.
2. Prerequisite test result need to be briefly displayed in the table.



Re: Thanks

1 pesan

<iji@ogu.edu.tr>

Min, 18 Nov 2018 pukul 03.50

Kepada: anasufibanawi <anasufibanawi@student.upi.edu>

Dear Anasufi Banawi

We received your review of the manuscript. Thank you very much for your valuable contribution in review process. The department highly appreciates your contribution as reviewer.

Sincerely yours,
Editorial
International Journal of Instruction

From: "anasufibanawi" <anasufibanawi@student.upi.edu>

To: "iji" <iji@ogu.edu.tr>

Sent: Saturday, November 17, 2018 4:21:11 AM

Subject: Re: Review a Manuscript

Pada tanggal 11 Nov 2018 9.26 PM, "anasufi banawi" <anasufibanawi@student.upi.edu> menulis:

Dear IJI editor,
Thank you very much for your information.
Through this email I am ready to review the above manuscript.
Thank you very much for your attention.
Sincerely your,
Anasufi Banawi

Pada tanggal 10 Nov 2018 8.48 PM, <iji@ogu.edu.tr> menulis:

Dear Anasufi Banawi,

Subject:

"Effects of Instructional Models and Spatial Intelligence on the Mathematics Learning Outcomes after Controlling Students' Initial Competence"

We have identified you as one of the most suitable people world-wide to review the above manuscript. We hope that you will find this manuscript of interest. If you want we can send you a review certificate. Thank you very much for your consideration and contributions.

Please could you confirm the receipt of this e-mail?

Note: If it is possible, could you please send your report within two weeks?

Sincerely yours,
Editorial
International Journal of Instruction

International Journal of Instruction
<http://www.e-iji.net>

-



Re: Thanks

1 pesan

<iji@ogu.edu.tr>

Sab, 30 Mar 2019 pukul 08.18

Kepada: anasufibanawi <anasufibanawi@student.upi.edu>

Dear Anasufi Banawi

We received your review of the manuscript. Thank you very much for your valuable contribution in review process. The department highly appreciates your contribution as reviewer.

Sincerely yours,
Editorial
International Journal of Instruction

From: "anasufibanawi" <anasufibanawi@student.upi.edu>

To: "iji" <iji@ogu.edu.tr>

Sent: Friday, March 22, 2019 3:40:14 PM

Subject: Re: Revised Manuscript

Sincerely yours,
International Journal of Instruction

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Letter of reply to the comments

We deeply thank Editorial International Journal of Instruction and the two anonymous referees for reviewing our manuscript submitted to IJI (manuscript number 461018) entitled "Effects of Instructional Models and Spatial Intelligence on the Mathematics Learning Outcomes after Controlling for Students' Initial Competence". We were very pleased to read their comments and suggestions for improving our manuscript. We have addressed all comments and revised the manuscript accordingly. Please note that the English expressions of this manuscript has been corrected and improved by a native speaker of English.

Reply to the associate editor's comment (461018e)

Comment *"The paper has been seen by two expert reviewers who generally agree that the paper can be published after some revision. However, the reviewers also identify a long list of problems and make many important comments, most of which I find reasonable, and the paper clearly needs very substantial modification."*

--- We accepted the comment. We have addressed all comments and revised the manuscript accordingly.

Replies to the comments of reviewer #1 (461018e)

Comment [1] *"It is required a further explanation to comprehend why someone needs this research"*

--- We accepted the comment and added a brief explanation in lines 36-47.

Comment [2] *"METHOD: a. An advanced information is required for instrument (test) and an empirical validation of instrument: participants, process, and so forth, b. b. An advanced explanation about categorization ways (score) and sample placement in the class."*

--- We accepted the comment and added a brief explanation in lines 265-279.

Comment [3] *"DISCUSSION: a. Although research findings have been exposed well, discussion pertaining to those findings are still less."*

--- We accepted the comment and added explanation in lines 298-303, 332-336, 345-359, 358-375, 381-406, 418-428. Please note that we added 4 hypotheses in to more clarify the discussion.

Comment [4] *"DISCUSSION: b. The t-test value of the calculation results and the t-test value of the table need to be made in a special table."*

--- We accepted the comment and added a brief explanation in lines 324, 384.

Comment [5] *"CONCLUSIONS: It is recommended to make summary (not per point) and the need for further explanation regarding the implications of the research findings."*

--- We accepted the comment and added a brief explanation in lines 440-450.

Replies to the comments of reviewer #2 (461018b)

Comment [1] *"I suggest that a 3 reviewer, who must be a statistician, should revisit the*

statistics used (that is, was it a t-ANCOVA or two-way ANCOVA?), as well as, statistics terminologies (that is, "experimental quasi or quasi-experimental or experimental?)."..

--- Thanks for the comments. The statistics used are two-way ANCOVA while the t-test is a further test after there is an interaction between the learning model and spatial intelligence on mathematics learning outcomes. This type of research is a quasi-experimental.

Comment [2] *"Did you (the author of the article) mean "quasi-experimental"? You mentioned it twice as "experiment quasi" and twice as "experimental" only. Which is which, really? Please be consistent with your use of terms/phrases.."*

--- Thanks for the comments. Quasi-experimental designs are similar to randomized experimental designs in that they involve manipulation of an independent variable but differ in that subjects are not randomly assigned to treatment groups. Because the quasi-experimental does not provide full control, it is extremely important that researchers be aware of the threats to both internal and external validity and consider these factors in their interpretation. (Ary, 2010:316). Quasi-experimental research is Research in which the investigator can control the treatment and the measurement of the dependent variable but cannot control assignment of the subjects to treatment., (Ary, 2010: 648)

Comment [3] *"Who has low competence: the material or the one studying? Here how it was....: "...low of."*

--- Thanks for the comments. Those who have low competence are students.

Comment [4] *"initial competence of the new material being studied"*

--- --- Thanks for the comments. Initial competencies relate to the abilities students have before new material is learned.

Comment [5] *"Check this for parallelism: "...breaks down numbers, constructs geometric spaces, and the announcement or extension of ideas associated with numbers and geometry"*

--- We accepted the comment and revised it accordingly in line 61-63

Comment [6] *"Check grammar: "...it is required an intelligence that must be possessed by students...""*

--- We accepted the comment and revised it accordingly in line 67.

Comment [7] *"Check for subject-verb agreement: "Students who has high spatial intelligence will understand the mathematics better and their learning outcomes are also good consequently." Improve this sentence even more."*

--- We accepted the comment and revised it in line 71-72.

Comment [8] *"Lengthy sentence: "Mathematics material should be hierarchically arranged, meaning that higher material is always based on the previous material, for example: material of division is learned after the multiplication, also to study geometry is arranged after learning two dimensional figure. "In other words, rewrite the quoted material."*

--- We accepted the comment and revised the sentences in line 73-78.

Comment [9] *"State explicitly if these authors – "McCormick, Clark, & and Raines (2015) and Killian & and Bastas (2015)" – mentioned "instructional models." Stated this way, you provide the name of their model/s"*

--- **Thank you for the comment. Those of McCormick, Clark, & and Raines (2015) and Killian & and Bastas (2015) do not mention instructional model. We provide line 91-98 to explain previous models that support this study.**

Comment [10] *“Correct this: "Previous studies...show that learning process that involving students actively will increase..."”*

--- **Thank you for the comment. Please see our reply to Comment [9].**

Comment [11] *“Did this word “scientific” relate specifically to your research study about mathematics learning outcome considering that there is still a difference between their usage?”*

--- **Thank you for the comment. In order to avoid bias in meaning as your point out, we changed the word “scientific” to be “scholastic” (line 88) and “educational” (line 89).**

Comment [12] *“Consider your use of adjectives or compound nouns "...structuralist / objectivist / behaviorist comprehension..."”*

--- **Thank you for the comment and follow your suggestion in line 110.**

Comment [13] *“Please clarify at the beginning/introduction, not in the middle, of your article the meaning of "initial competence."*

--- **We accepted the comment and add clarification concerning “initial competence” in line 58-60.**

Comment [14] *“Please cite properly: who among these authors - "John Dewey (YEAR), Resnick (YEAR), and Vygotsky (YEAR)" - works/books/articles/etc. you were referring to.*

--- **We accepted the comment and revised it accordingly in line 137.**

Comment [15] *“In this particular paragraph, whose "model" whom you referred to since you mentioned Eggen and Kauchak, Taba, Dewey, Resnick, and Vygotsky? How about “Syntax” in the same paragraph? Was it the same with the "phases [?] of the process"?”*

--- **Thank you for the comment. The integrative model used in this study is the Eggen and Kauchak model. Whereas the syntax here is the same as the phase.**

Comment [16] *“Try to realign this paragraph according to the authors' contributions, such that Eggen and Kauchak's (2012) work flows smoothly: "The integrative instructional model of EGGEN AND KAUCHAK (2012) WAS developed based on Hilda Taba's (YEAR) thought, designed to promote students' ability to think and is based on constructivism learning theory that affirms that learning is an active process in which learners use sensory input to build meaning from experience. The constructivist important principles as developed by John Dewey, Resnick, and Vygotsky (YEAR) are reflected in the integrative model, including: (1) learners need to "do" something or involved in so-called "active learning" (2) people learn to learn because they are learning, (3) important action of building meaning is mental, (4) learning involves language, and (5) learning is social. The integrative model has steps or phases in learning that should be completed by teachers and students commonly referred to as Syntax. EGGEN AND KAUCHAK's (2012) divided the four phases of the process of implementing integrative instructional models, including: 1) explaining, comparing, and looking for patterns, 2) explaining similarities and differences, 3) formulating hypotheses, and 4) generalizing to form broad relationships."*

--- **We accepted the comment and revised it accordingly in line 126-136.**

Comment [17] *“Be consistent throughout: Who was the first author? Is it Eggen or Kauchak (2012). Likewise, do not forget to include the year the work was published by the author (e.g., “...WAS developed based on Hilda Taba's (YEAR) thought...”). Please note that you also missed to use the linking verb “was”.”*

--- We accepted the comment and rearranged the sentences in line 126-136.

Comment [18] *“Try to be pithier: “ In this study, the integrative model is a model developed by Don Kauchak and Paul Eggen (YEAR) is an instructional model that aim to support students in developing self-learning skills using a variety of thinking skills (Kilbane & Milwan, 2014)’*

--- We accepted the comment and rearranged the sentences in line 126-136

Comment [19] *“Were you referring to two-way ANCOVA or t-test of ANCOVA?.”*

--- Thanks for the comments. In this study, the statistics used were two-way ANCOVA, while the t-test was a further test after the hypothesis was accepted.

Comment [20] *“These sentences/statements must be reported immediately after presenting Table 2. Please comply with this instruction all throughout your paper.”*

--- We accepted the comment and revised it accordingly in every table.

Comment [21] *“Present your findings using a table, for example, and then provide your analysis and interpretation. For instance, the following sentences/statements must be reported immediately after presenting Table 2. “The result of descriptive analysis specifies that the mathematics learning outcome of students who have high spatial intelligence after controlling their initial competence that were taught by integrative instructional model has an average of 81.76, while those taught by direct instruction has an average of 68.24. On the other hand, the learning outcome of students with low spatial intelligence after controlling initial competence has an average of 63.35 for integrative instructional model, yet 66.7 for direct instruction.” Please comply with this instruction all throughout your paper.”*

--- We accepted the comment and revised it accordingly in every table.

Comment [22] *“Under the Conclusion section: “Initial competence” was your covariate/“affixed variable,” and it has “NOT” been “the focus of the research[,] but might affect the results of research and could “NOT” be manipulated”; so, why not focus on your other variables? Further clarification and elaboration on this part of your research are required.”*

--- We accepted the comment. As the initial competence was not the focus in the research, we have deleted the sentence. Please re-read the conclusion section.

Comment [23] *“How come the following appeared in your in-text citations, but were NOT included in the “References” section of your research paper? 1. Adekola, T. (2013) Card Magic and My Mathematical Discoveries. St, Raleigh: Lulu Publishing. p.3. 2. Ishak, N. & Awang, M. M. (2017). The relationship of student learning styles and achievement in history subject. The International Journal of Social Sciences and Humanities Invention, 4/3, 3372-3377. 3. Lambert, R. & Tan, P. (2017). Conceptualizations of students with and without disabilities as mathematical problem solvers in educational research: A critical review. Educational Sciences, 7/51, 1-18.”*

--- We received the comments and adjusted them with reference. Whereas Lambert, R. & Tan, P. (2017) have been referred to in line 422.

Comment [24-29] *“Out of 30 minus 3 references, related literature on INTEGRATIVE learning were very few and not very much related to math learning: 1. Andayani & Gilang, L. (2015).*

The effectiveness of integrative learning- based textbook toward the local culture comprehension and Indonesian language skill of foreign students, International Journal of Humanities and Social Science, 5/10, 197-207. 2. Niehaus, E., Holder, C., Rivera, M.; Garcia, C.E., Woodman, T. C., & Dierberger, J. (2017). *Exploring integrative learning in service-based alternative breaks. The Journal of Higher Education, 1-25.* 3. Peet, M., Lonn, S., Gurin, P., Boyer, K. P., Matney, M., Marra, T., Taylor, S. H., & Daley, A. (2011). *Fostering integrative knowledge through ePortfolios. International Journal of ePortfolio, 1/1, 11-31.* 4. Pollack, S. (2016). *Building bridges: Experiential and integrative learning in a Canadian Women's Prison. Journal of Teaching in Social Work, 1-16.* 5. Singer, K. P. (2015). *Investigating the extent that an integrative learning module broadens the perception of first-year students about the engineering profession, American Journal of Engineering Education, 6/2, 99-112.* Since you mostly cited not-so related literature (that is, those in humanities/social sciences, higher education, ePortfolio, and women's prison) and not so much on maths, please consider finding related ones that will back up or contradict your research findings, analysis, and interpretation. Otherwise, state in your introduction the "research gap," if any, a moiety of research findings specifically about your own study. NOTE: Peet, et. al's work was not even within the last five (5) years of publication considering it was a research journal article. Kindly look for latest research works on integrative instructional method.

“On DIRECT instruction, you have:

6. Jones, D. & Ramirez, H. (2013). *Effects of direct instruction and corrective feedback on second language acquisition. National Forum of Educational Administration and Supervision Journal, 30/1, 64-87.* 7. Zhang, D. (2017). *Effects of visual working memory training and direct instruction on geometry problem solving in students with geometry difficulties. Learning Disabilities: A Contemporary Journal, 15/1. 117-138.*”

“Still on language acquisition, but also geometry. Good, anyway! Consider adding more related literature, just as I already pointed out above.

“On models/strategies...8. Campbell, L. & Campbell, B. (2009). *Mindful Learning: 101 Proven Strategies for Student and Teacher Success. California: Corwin Press. p.* 9. 9. Eggen, P. D. & Kauchak, D.P. (2012). *Strategies and models for teachers: Teaching content and thinking skills, 6th ed. Boston: Pearson.* 10. Kilbane, C. R. & Milwan, N.B. (2014). *Teaching models: Designing instruction for 21st century learners. New Jersey: Pearson.*”

“On visual maths II. Boaler, J., Chen, L., Williams, C. & Cordero, M. (2016). *Seeing as understanding: the importance of visual mathematics for our brain and learning. Journal of Applied & Computational Mathematics, 5/5, 1-6.* 12. Turgut, M. & Yilmaz, S. (2012). *Relationships among preservice primary mathematics teachers' gender, academic success and spatial ability. International Journal of Instruction, 5/2, 1-20.*

13. Yarmohammadian, A. (2014). *The relationship between spatial awareness and mathematic disorders in elementary school students with learning mathematic disorder. Psychology and Behavioral Sciences, 1/1, 33-40.*

“Thus, out of 27 references - less 13, more than half of your literature materials require a evaluation. In the event you want to offer a justification for my review, please feel free to course it through the editor.”

--- We accepted the comments and revise them. All cited-references are related to this study and we have also added several new references.

Comment [30] “As an important researcher's interpretation skills for journal article publication, please put meanings to your statistical findings by citing other researchers' affirmative or contrary findings on your "Results and Discussion" section; if not, at least in your "Conclusion" section. For instance, "Mathematics learning outcome with integrative instructional model of students having low spatial intelligence is lower in comparison to direct instruction, after controlling the initial competence." So, what? ...Addresss the "why" in the "so

what?" to make your research even more meaningful even among laypersons.

--- We accepted the comment and revised it accordingly in line 298-303, 332-336, 345-359, 358-375, 381-406, 418-428

Comment [31] *"Furthermore, you are required to provide recommendations other than conclusions. "*

--- We accepted the comment and revised it accordingly in line 440-450.



Effects of Instructional Models and Spatial Intelligence on the Mathematics Learning Outcomes after Controlling for Students' Initial Competency

Mohamad Salam

Dr., Department of Mathematics Education, Halu Oleo University, Kendari, Indonesia,
mohamad.salam@uho.ac.id

Nurdin Ibrahim

Prof., Jakarta State University, Indonesia, nurdin1349@yahoo.com

Moch Sukardjo

Dr., Jakarta State University, Indonesia, asukardjo@yahoo.com

The present study determined the effects of instructional models and spatial intelligence on students' mathematics learning outcomes after controlling for their initial competence. The study was conducted at Senior High School (SHS) 6 Kendari, Indonesia using a quasi-experimental method designed by level 2×2. Samples consisted of 40 students selected randomly. The data were analyzed using either two-way ANCOVA at the 0.05 significance level. The results showed that mathematics learning outcome of students who were taught by integrative instruction was higher than those taught by direct instruction after controlling the initial competency. There is an interaction effect between the instructional model and spatial intelligence on mathematics learning outcome. Learning outcome of students who have high spatial intelligence and taught by integrative instruction was higher than those taught by direct instruction, and learning outcome of students who have low spatial intelligence and taught by integrative instruction was lower than those taught by direct instruction.

Keywords: integrative model, direct model, spatial intelligence, learning outcome, initial competency

INTRODUCTION

Learning should be an "empowering process", a fun and continuous process established in a sustainable manner to develop the potency of learners (students) and enhancing their knowledge for solving their current and future problems. Students who will compete for success in their future life must be able to learn new concepts and skills. In

Citation: Salam, M., Ibrahim, N., & Sukardjo, M. (2019). Effects of Instructional Models and Spatial Intelligence on the Mathematics Learning Outcomes after Controlling for Students' Initial Competency. *International Journal of Instruction*, 12(3), 699-716. <https://doi.org/10.29333/iji.2019.12342a>

mathematics learning, to date, many students still regard mathematics as "complicated" and "difficult" subject. They express this status quo in psychological or physical phenomena such as "despair", "stress", "demotivation", "depression", "fear", "fatigue", "headache" and "nausea". These expressions illustrate that mathematics learning applied by teachers has not been a fun activity and is often irrelevant to daily real-life experiences. In a substantial sense, the learning process up to now has not provided access for students to develop independence through discovery in the process of thinking. Students activity is more emphasized by listening and recording the material given by the teacher, hence they are become passive, unfocused and feel bored. As a result, students' learning outcomes in mathematics are still low and have not reached yet the minimum criteria targeted by the school.

The low mathematics learning outcomes were also experienced by 11th-grade students in Senior High School (SHS) 6 Kendari. The average mathematics learning outcomes for this school can be seen in table 1 below.

Table 1
Mathematics Learning Outcomes of 11th-Grade Students Majoring in Science in the Last Three Years

School year	Number of students	Average	Percentage (%)	
			Under MMC	Above MMC
2015	134	60.93	87.3	12.7
2016	136	62.5	89	11
2017	118	64.19	80	20

Table 1 above gives the meaning that the average mathematics learning outcomes in 2015 were 60.93 with the percentage of students below the minimum completeness criteria (MMC) as much as 87.3%. In 2016, the average score of mathematics subjects was 62.5 with 89% of students below the MCC, and in 2017 as many as 20% of students already met the MCC, yet 80% were still under the MCC. This data provides a very clear depiction that the values obtained by students have not met the minimum competency standards that must be mastered (Source: Deputy head of the curriculum field of SHS 6 Kendari, 2018). One of the causes of the low learning outcomes is that students are only trained to do practice questions in the textbook without being implanted in a deep concept of building knowledge, but not trained to think critically.

Previous studies, e.g., Ishaq & Awang (2017), Wahid, Yusof, & Razak (2013), and Pehlivan & Durgut (2017) summarized that there are many factors influence learning outcomes, both by internal and external factors from the student. The internal factors include learning motivation, level of intelligence, and learning styles, while external factors comprise instructional models used by teachers, learning strategies, learning approaches, learning methods and the ability of teachers in managing to learn in the classroom. In mathematics learning, in addition to the above factors, Acharya (2017) found several other factors that led to the difficulty of learning mathematics which has an impact on the learning outcomes, such as negative perceptions and anxiety to mathematics subject, as well as the low of initial competence of the new material being studied. Initial competence is the sum of a person's previous learning and experiences

(Cooper, et.al., 2018). Moreover, Murphy & Alexander (2005) emphasized that Initial competence is the sum of what an individual knows.

According to Kline (1962), mathematics proper, as we have often emphasized, deals with numbers, geometrical figures, and generalizations or extensions of ideas involving numbers and geometrical figure. It shows that the characteristic of mathematics is having an abstract object, thus a student is not easy to understand the mathematics material taught by the teacher. To anticipate such abstractions, mathematics needs to be visualized to be easily understood by students. In order to visualize the mathematics object, students must have a specific intelligence; the so-called spatial intelligence. Spatial intelligence is the ability to understand the visual material accurately, to transform and modify one's initial perception through visual observation and mental imagination and recreate aspects of the visual experience, even without the relevant physical stimuli (Gardner, 2011). Students with high spatial intelligence may have a better understanding in mathematics as in that the learning outcomes will be maximum.

Mathematics material should be hierarchically arranged and systematically from low school level to high school level, from low to high-grade classes. Therefore, the initial competence of students is one of the prerequisites to master the next learning in order to obtain better results. Initial competence of students is needed for teachers to determine the appropriate entry behavior line so that appropriate steps can be taken in the next lesson.

To date, the instructional model applied by a mathematics teacher in SHS 6 Kendari is a direct instructional model which only focuses on the teacher without trying other instructional models that can activate the students, consequently the increase of mathematics learning outcomes from year to year is not significant. Previous studies of McCormick, Clark, & Raines (2015) and Killian & Bastas (2015) show that learning process that involving students actively will increase: 1) motivation and interest in learning, 2) interaction between teachers and students, 3) critical thinking skills and solving problems, and 4) student performance. The results of those studies indicate that the instructional model which involves students actively will be able to grow the ability to think, to work, to be scholastic and to communicate as one of the important aspects in life skills. Thus, students can communicate the results of educational work systematically and can make the learning process become more qualified.

Mathematics is basically a subject where doing is more prominent than reading, and is one of the important subjects at the secondary school level (Adeniji at. Al; 2018). Several reasons have been linked to unsatisfactory student learning outcomes in mathematics including poor teacher learning models (Aminah at. al, 2018; Mulyono at. al, 2018; Retnawati et al., 2017; Turgut & Turgut, 2018; Yerizon et al., 2018). Therefore, it is recommended for teachers to find effective learning models in order to gain an in-depth understanding of systematic knowledge structures and train students' thinking skills which in turn will lead to better learning outcomes.

Integrative instructional model is one model that can be applied to overcome the low quality of students. This model can help students to develop a deep and systematic

knowledge framework and simultaneously train critical thinking skills (Niehaus et. al; 2017). In this instructional model, teachers provide a combination of facts and concepts within a matrix or other arrangement forms such as detailed maps or hierarchies. Under the guidance of teachers, students try to find patterns and causal relationships within the information. In its application, integrative instruction is not intended to enable students to remember specific facts or concepts, but to enable students to discover and understand the relationships among them, to formulate their explanations, and to consider additional possibilities (hypotheses). This model is different from the model of learning that is widely applied so far, i.e. direct instruction, in which learning in the classroom is dominated by structuralist/objectivist/behaviorist comprehension, which aims to keep students remembering information, then going on the memorial. The integrative model is based on the view that students build their own understanding of the topics they are learning rather than recording lessons in a systematically arranged form.

Huber et. al (2007), as quoted by Railean (2015) suggests that integrative instruction is developing the ability to create, recognize, and evaluate relationships between concepts of different fields or contexts. This definition provides an idea that integrative instruction is an essential process in which students combine information with experience to create new learning and meaning. In the process, students create, recognize, and evaluate the relationships between concepts and produce simple connections between ideas and experiences they gain from inside and outside the classroom.

In order to know the phenomenon of both types of integrative model and direct instructional model on mathematics, as well as how it relates to spatial intelligence and initial competence of student to improve mathematics learning outcomes, the influence of instructional models (i.e. integrative and direct) and spatial intelligence levels (i.e. high and low) towards learning outcomes by controlling for initial competence are essential to study. The integrative model is constructed on an inductive strategy which was first coined by Hilda Taba (1960) and popularized by Eggen and Kauchak (2012). This model is based on a controlled and structured discussion that allows teachers to focus on helping students obtain academic information while practicing complex reasoning skills. In integrative discussions, students have the opportunity to build organized personal understanding to gather knowledge and information that includes complex relationships between facts, concepts, and generalizations (Estes & Mintz, 2014; Kilbane & Milman, 2014).

The learning theory that underlies all integrative learning models is that of constructivism theory which confirms that learning is an active process in which learners use sensory input to build meaning from experience. The constructivist important principles as developed by John Dewey (1916), Resnick (1987), and Vygotsky (1962) are reflected in the integrative model, including (1) learners need to "do" something or involved in so-called "active learning" (2) people learn to learn because they are learning, (3) important action of building meaning is mental, (4) learning involves language, and (5) learning is social. The integrative model has steps or phases in learning that should be completed by teachers and students commonly referred to as

Syntax. Eggen and Kauchak (2012) divide the four phases of the process of implementing integrative instructional models, including 1) explaining, comparing, and looking for patterns, 2) explaining similarities and differences, 3) formulating hypotheses, and 4) generalizing to form broad relationships (Kilbane & Milman, 2014).

The direct instructional model was developed based on B. F. Skinner's (1953) view of the teaching-learning process, particularly the influence of operant conditioning theory, that all behaviors are generated from external stimuli. In the direct instructional model, a person's response or student behavior (learn) is directly related to the stimulus (learning) in the classroom. The direct instructional model has a positive effect on learning especially when it is used to teach content that can be broken down into discrete segments with observable and measurable results (Kilbane & Milman, 2014). Flores & Kaylor, (2007); Leno & Dougherty (2007), that the direct instructional model is a learning model based on extensive and highly effective research results used to teach low motivated students and students with learning difficulties. This model involves teacher demonstrations and explanations coupled with student exercises and feedback to help them gain the real knowledge and skills required for further learning.

As described above, the role of the teacher is quite imperative to the direct instructional model. The arrangement and management of lessons learned by teachers will greatly determine the ability of students to master the knowledge, attitudes, and skills. Direct instruction is not only dominated by behavioristic principles. In its development, direct instruction also accommodates the principles of cognitive psychology, including the importance of attention processes and long-term memory storage in learning, the limited capacity of working memory, and the value of learning basic skills for autogenetic. In addition, the principles of learning in sociocultural theory may contribute to the direct instruction by emphasizing that teachers should provide sufficient scaffolding (especially in the early learning process) and involve students into small group activities in training sessions. The phase of the direct instructional model according to Eggen and Kauchak consists of four phases including (1) introduction, (2) presentation, (3) guided training, and (4) self-training (Eggen & Kauchak, 2012).

Spatial intelligence is one of eight types of multiple intelligence developed by Howard Gardner. In short, spatial intelligence is defined as the ability to identify through visual observations and mental imagination (Williams & Newton, 2007). More comprehensively, Taylor (2013) defines spatial intelligence as the ability to think in three dimensions in terms of spatial reasoning, mental imagery, image manipulation, graphics and artistic skills, and active imagination. Simply put, spatial intelligence is the ability to visualize concepts and relationships between concepts (Mckee, 2004). Spatial intelligence can also be stated as the ability to have the sensitivity to adapt to sharply visible visual forms, balance, color, lines, shapes, and space (Ross, 2005).

Students with spatial intelligence enjoy artistic activities, read maps, graphs, and diagrams, and think in pictures. They are able to visualize images clearly and can solve jigsaw puzzles easily. They often need to see images before they can understand the meaning of the words. Images can provide contextual hints for words and help students learn to read and spell and can recognize relationships between objects. In addition,

students with spatial intelligence generally record the subject matter by drawing to retain the content. Students can learn to spell words by looking at pictures. The use of these images is very effective because every time students hear the word, they see a picture of the word and in the picture, there is the correct spelling. Remembering this picture allows them to translate the image into words to the written-page.

Sciltz et. al (2012) outlines a number of steps needed to understand the surrounding information related to spatial intelligence, as follows: (a) Spatial relationship: the ability to understand how objects are positioned in space, including left-right orientation and rotation, (b) Visual discrimination: the ability to recognize objects based on familiar characteristics and distinguish objects from one another, even if they are presented into different scenes, (c) Figure-ground discrimination: the ability to focus on visual details with background distractions, (d) Visual integration: the ability to integrate different parts object or event into a meaningful unity, (e) Visual closure: the ability to recognize familiar objects when they are not displayed in their entirety or completely visible, (f) Visual memory: the ability to accurately recall vital visual information, (g) Visual-motor integration: the ability to precisely remember and make a replica of a geometry, and (h) Visual perceptual ability: the ability to perceive and interpret information from surrounding environment.

The initial competence of student, also defined as "the sum of what an individual knows" (Murphy & Alexander, 2005), is an important component that cannot be separated from the learning process itself. The importance of paying attention to the initial competence in learning is due to the fact that the initial knowledge is the raw material required for learning. This initial ability acts as a mental hook that will lead students to the new information. In addition, the initial competence is also the basic building of knowledge and skills material. According to Biemans and Simons (1996), as quoted by Campbell & Campbell (2009), initial competence is all the knowledge that learners have when entering a potentially relevant learning environment to gain new knowledge.

The initial competence referred to this study is the initial knowledge in mathematics. Since mathematics is a well-organized structure, and its material arranged in a hierarchically interrelated manner between one material with others, the prerequisite knowledge or initial competence of students is an important thing that must be considered in the mathematics learning process. This shows that students' initial math skills have an influence on learning outcomes. Mathematics instructional model should be developed in order to give the opportunity to students in developing their knowledge gradually both horizontal and vertical. By paying attention to the students' initial competence, teachers are expected to develop a more appropriate instructional model that includes preparations of teaching materials, learning steps, and appropriate evaluation tools.

The previous study of Muthomi & Mbugua (2014) suggests that there is a significant correlation between teacher instructional strategies and student learning outcomes. Pollack (2016) and Singer (2015) added that integrative instructional model can increase students' involvement actively in learning and improve students' understanding

and independence in learning. Furthermore, the results of Andayani & Gilang (2015) and Peet et al., (2011) concluded that in addition to improving students' understanding of acquiring knowledge, integrative instruction provides significant advantages to students related to the six dimensions of knowledge that are: 1) identifying, demonstrating and adapting to the knowledge gained in different contexts; 2) adapt to differences (people and situations) in order to create solutions; 3) understanding and directing self as a learner; 4) being a reflexive, accountable, and relational learner; 5) identifying and differentiating one's own and others' perspectives; and 6) developing a professional digital identity.

The investigation results of Turgut & Yilmaz (2012) and Yarmohammadian (2014) emphasized the importance of spatial intelligence in mathematics learning and showed a significant correlation with student learning outcomes. In addition, geometry learning is closely related to students' spatial intelligence (Boaler, et. al; 2016); so that students with high spatial intelligence, with effective instructional models, will more easily build their mathematical knowledge than students with low spatial intelligence. In contrast, Jones & Ramirez (2013) shows that indirect instruction, students have a great dependence on teachers in acquiring their knowledge, thus students with low spatial intelligence will feel more comfortable with structured and guided learning. This result is consistent with Zhang (2017) and Lamber & Tan (2017) results, indicating that students with low spatial intelligence will be more effective if learned using teacher-centered guided instructional models.

Based on the above description and supported by empirical research results, this study aims: (1) to distinguish the difference of mathematics learning outcomes of students who are taught by integrative instructional model and direct instructional model, after controlling students' initial competence, (2) to elaborate interaction between integrative and direct instructional models on the mathematics learning outcomes, associated with spatial intelligence of students, after controlling initial competence. The results of this study can be used to develop learning programs utilizing integrative learning models in schools, especially at the secondary school level, based on students' spatial intelligence and initial competency.

METHOD

The study was conducted at SHS 6 Kendari by quasi-experimental method measuring two main variables, i.e., dependent and independent variables. The dependent variable was the results of mathematics learning in 11th-grade students majoring in science. The independent variables consisted of two variables, including: (1) treatment variable, in this case, was the instructional model, consisted of integrative and direct learning model models, and (2) moderator variable, which was the students' spatial intelligence, consisted of high and low spatial intelligence. This study also took student's initial competence as covariate variable. It was an affixed variable that was not the focus of the research but might affect the results of research and could not be manipulated. The current study used quasi-experimental method designed by level 2x2 (Table 1). Sampling was carried out on 36 students of 11th grade majoring in science (1st class) as an experimental class and 36 students in 11th grade majoring in science (2nd class) as a

control class, with a simple random sampling technique. Both classes were then given a spatial intelligence test to get the research subjects by taking 27% of the upper group and 27% of the lower group, thus 10 people were obtained from each group (Osterlind, 2002).

The data on mathematics learning outcomes, spatial intelligence, and students' competence was obtained through tests of cone slice material that had been validated by experts and tested empirically in 12th-grade students of SHS 6 Kendari with the consideration that they had studied the material. The results of validity tests for mathematics learning outcomes instrument obtained 34 valid items out of 40 tested items with a reliability level of 0.89, the spatial intelligence instruments yielded 48 valid items from 55 items (reliability level = 0.92), and the initial ability instrument provided 25 valid items from 30 items (reliability level = 0.88). Data analysis techniques include (1) descriptive analysis: used to find the average, median, standard of deviation, maximum and minimum values. (2) prerequisite analysis testing includes the normality test, homogeneity test, linearity test, and regression line alignment test, and (3) Inferential analysis: conducted through covariance analysis (ANCOVA). If there any interaction between treatment variables and attribute variables, then t-test was further performed (Huitema, 2011).

Table 2
Quasi Experimental Design of level 2×2

Moderator variable	Treatment variable	
	Integrative instructional model (A ₁)	Direct instructional model (A ₂)
High spatial intelligence (B ₁)	A ₁ B ₁ [X, Y] _{11k} k = 1, 2, ..., n ₁₁	A ₂ B ₁ [X, Y] _{21k} k = 1, 2, ..., n ₂₁
Low spatial intelligence (B ₂)	A ₁ B ₂ [X, Y] _{12k} k = 1, 2, ..., n ₁₂	A ₂ B ₂ [X, Y] _{22k} k = 1, 2, ..., n ₂₂

A₁B₁ = students taught by integrative learning model which have high spatial intelligence, A₂B₁ = students taught by direct learning model which have high spatial intelligence, A₁B₂ = integrative learning model - low spatial intelligence, A₂B₂ = direct learning model - low spatial intelligence, X = scores of students' initial competence in mathematics, Y = scores of mathematics learning outcome, k = group (sample of each cell).

FINDINGS AND DISCUSSION

Result of descriptive analysis is presented in table 3.

Table 3
Descriptive Analysis Result

Statistical data		Learning model (A)			
		Integrative instructional model (A ₁)		Direct instructional model (A ₂)	
Spatial intelligence (B)		X	Y	X	Y
B ₁	n	10	10	10	10
	Average	59.6	81.76	60	68.24
	Minimum	48	73.53	48	55.88
	Maximum	68	88.24	68	79.41
	Median	60	82.35	60	67.65
	Standard of deviation	5.48	4.56	6.53	8.18
B ₂	n	10	10	10	10
	Average	58.4	62.35	57.6	66.77
	Minimum	52	52.94	48	52.94
	Maximum	64	67.65	68	76.47
	Median	58	63.24	58	69.12
	Standard of deviation	4.7	5.15	6.85	7.73
	n	20	20	20	20
	Average	59	72.06	58.8	67.5
	Minimum	48	52.94	48	52.94
	Maximum	68	88.24	68	79.41
	Median	60	70.59	60	69.12
	Standard of deviation	5	11.03	6.63	7.78

Hypothesis I: Mathematics learning outcomes taught with integrative learning model are higher than direct learning model after controlling for initial competence

Results of descriptive analysis (Table 3) show that the average mathematics learning outcomes taught by integrative learning (A1) after controlling for initial competence (72.06) are higher than those of taught by direct learning model (A2) after controlling initial ability (67.5). The results are visually presented in Figure 1.

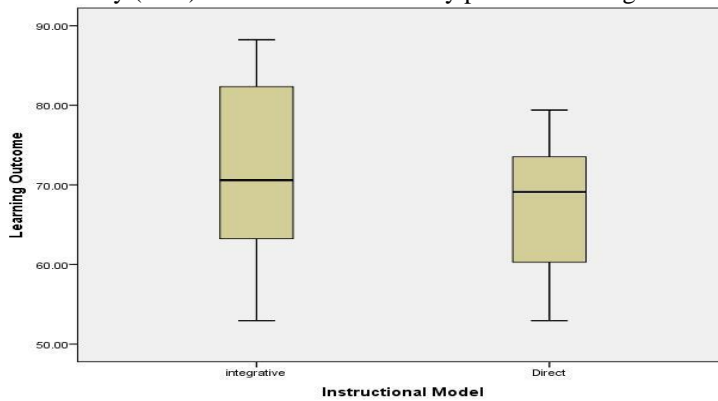


Figure 1
Boxplot Graph of Mathematics Learning Outcomes of Students Taught by Integrative and Direct Instructional Models

Table 4
Tests of Between-Subjects Effects (Dependent Variable: Y)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	2646.518 ^a	4	661.630	22.678	0.000
Intercept	356.853	1	356.853	12.232	0.001
X	544.220	1	544.220	18.654	0.000
A	195.952	1	195.952	6.717	0.014
B	836.970	1	836.970	28.688	0.000
A*B	873.997	1	873.997	29.958	0.000
Error	1021.108	35	29.175		
Total	198431.980	40			
Corrected Total	3667.626	39			

^a R Squared = 0.722 (Adjusted R Squared = 0.690)

(Covariates appearing in the model are evaluated at the initial competence value = 58.9000)

The result of two-way ANCOVA test (Table 3) shows that the source of variance among A obtained $F_{\text{count}} = 6.717$ with the sig. = 0.014 is smaller than $\alpha = 0.05$. This means that there is a significant difference in mathematics learning outcomes between students taught by an integrative instructional model (A1) with those taught by direct instruction (A2) after controlling initial competence. The result of t-test (Table 5) obtained $t_{\text{count}} = t_{0(A1 \times A2)} = 2.592$ higher than $t_{\text{table}} = t_{(0.05;37)} = 1.684$; suggesting learning outcome by integrative instructional model is significantly higher than direct instruction after controlling students' initial competence. This result shows that the hypothesis I is accepted.

Table 5
Summary of Advanced Test Results after Controlling Initial Competence A1 vs A2

Compared Groups	Df	t_{count}	$t_{\text{table}} (\alpha=0.05)$
A1 with A2	37	2.592	1.687

This finding is in agreement with the results of previous studies (Estes & Mintz, nd; Kilbane, R. ; Milman, 2014; Paul D. Eggen, 2012) that integrative learning encourages students to actively develop their mathematical knowledge by connecting various facts, rules and concept which they have had with the new information they obtain and then proceed with building hypotheses and making conclusions through scientific procedures, while students who are taught with direct learning model will tend to be passive and not facilitate themselves to find experience based on their own knowledge. Becker & Park (2011), Desjardins & Slocum (1993), and Niehaus et al. (2017) further emphasizes that the integrative learning model is more effective than the direct learning model.

Hypothesis II: There is an influence of the interaction between learning models and spatial intelligence on students' mathematics learning outcomes after controlling for initial competence

The result of descriptive analysis specifies that the mathematics learning outcome of students who have high spatial intelligence after controlling their initial competence that taught by the integrative instructional model has an average of 81.76, while those taught by direct instruction has an average of 68.24. On the other hand, the learning outcome of students with low spatial intelligence after controlling initial competence has an average of 63.35 for an integrative instructional model, yet 66.7 for direct instruction. This indicates descriptively that there is an interaction effect between integrative and direct instructional models on the mathematics learning outcomes after controlling for initial competence of students. This, moreover, implies that mathematics learning outcomes for students with high spatial intelligence learned by integrative learning model are higher than those taught by direct learning model after controlling for initial competence, while learning outcomes for students with low spatial intelligence and taught by integrative learning model are lower than those by direct learning model after controlling for initial competence (Figure 2).

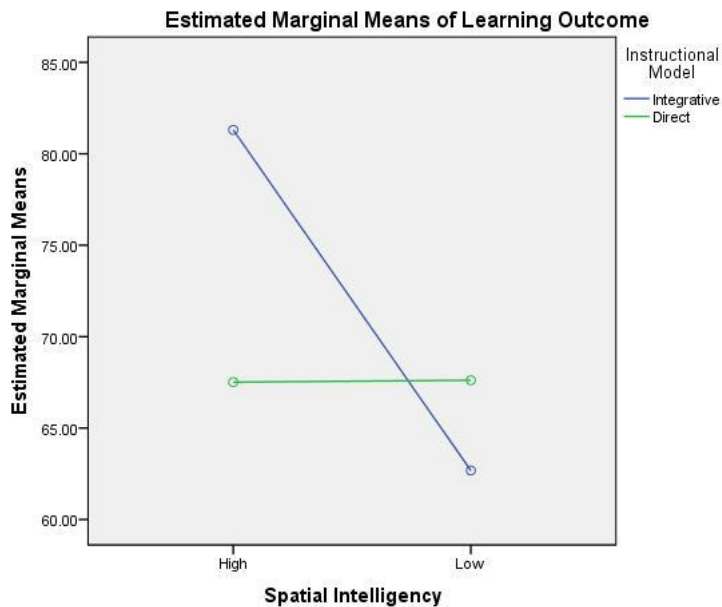


Figure 2

Graph of The Interaction Between Instructional Models and Spatial Intelligence on Mathematics Learning Outcomes After Controlling Students Initial Competence

The result of the ANCOVA test (Table 3), in line A×B interaction, obtained $F_{\text{count}} = F_{0(A \times B)} = 29.958$ with a value of sig. = 0.00 less than $\alpha = 0.05$; implying that there is a significant interaction effect between instructional models and spatial intelligence on students learning outcome after controlling their initial competence. This result shows that hypothesis II is accepted.

This finding is in line with the result of the study conducted by Andayani & Gilang (2015) that there is a significant positive interaction between integrative learning model and student learning interest in Indonesian Language learning outcomes for foreign students in Surakarta. Fazriyah (2017) emphasizes that there is an influence of interaction between the learning models and critical thinking on learning outcomes. Mulyono, Asmawi, & Nuriah (2018) further explained that there is an influence of interaction between learning model and learning independence on mathematics learning outcomes by controlling initial competence.

Hypothesis III: Mathematics learning outcomes of students with high spatial intelligence who are taught by integrative learning model are higher than those taught by direct learning model after controlling for initial competence

The results of the descriptive analysis in table 2 show that the average mathematics learning outcomes for students with high spatial intelligence are taught by the integrative learning model (A1B1) after controlling for initial competencies (81.76) and those taught by the direct learning model (A2B1) after controlling initial competence (68.24). Visually these results are illustrated in Figure 3.

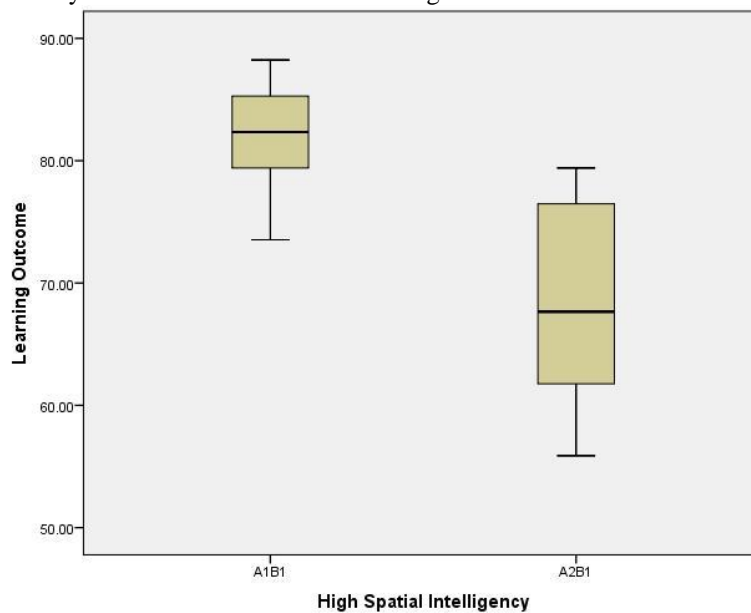


Figure 3
Mathematics Learning Outcomes of Students Who Have High Spatial Intelligence Taught by Integrative and Direct Instructional Models After Controlling for Initial Competence

Hypothesis III is tested using the t-test. The deduction is supported by further test result by using t-test in Table 6.

Table 6
Summary of Advanced Test Results after Controlling Initial Competence

No	Compared Groups	Df	t_{count}	$t_{\text{table } (\alpha=0.05)}$
1	A1B1 with A2B1	17	5.708	1.74
2	A1B2 with A2B2	17	-2.041	1.74

The results of the analysis in Table 6 show that the value of $t_{\text{count}} = t_{0(A1B1 \times A2B1)} = 5.708$ is greater than the $t_{\text{table}} = 1.74$ which means that the mathematics learning outcomes of students with high spatial intelligence that taught by integrative learning model are higher than those taught by direct learning model after controlling for initial competency. This indicates that hypothesis III is accepted.

This finding is in agreement with the study result of Zhao (2017) that integrative learning model will provide internal stimuli to students with high spatial intelligence to be able to process the learning given to build their knowledge for increasing the understanding of subject matter. On the other hand, students who have high spatial intelligence who tend to be active and like creative and explorative activities will easily become bored, lazy and lack of motivation in learning when taught by a direct learning model. This is because the direct learning is a teacher-centered learning model which is efficient and effective in teaching for targeted knowledge but inhibits the curiosity and creativity of students.

Hypothesis IV: Mathematics learning outcomes for students with low spatial intelligence taught by integrative learning model are lower than those taught by direct learning model after controlling for initial competence

The results of the descriptive analysis in Table 2 show that the average mathematics learning outcomes for students with low spatial intelligence taught by the integrative learning model (A1B2) after controlling for initial competence (62.35) is lower than the average learning outcomes of those taught by direct learning model (A2B2) after controlling for initial competence (66.77). Visually these results are explained in Figure 4.

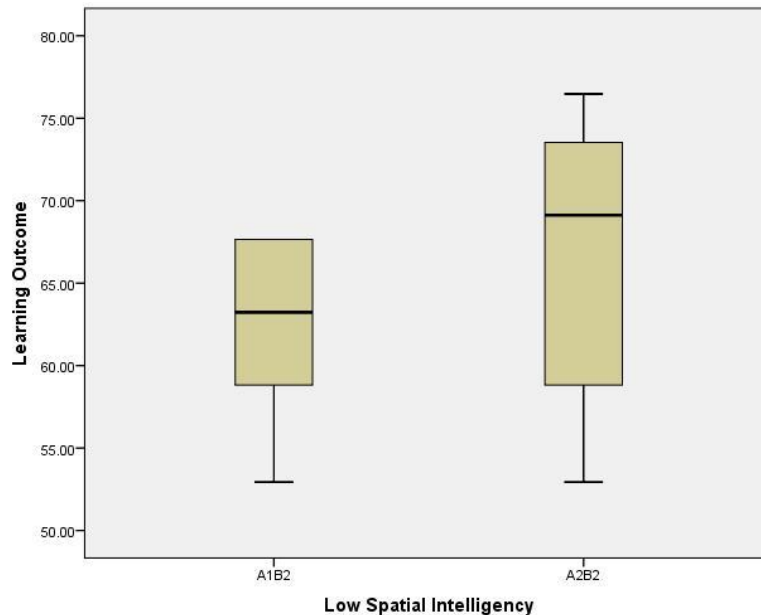


Figure 4
Mathematics Learning Outcomes of Students Who Have Low Spatial Intelligence Taught by Integrative and Direct Instructional Models After Controlling for Initial Competence

Further results by using t-test at table 5 obtained $t_{\text{count}} = t_{0(A1B2 \times A2B2)} = -2.041$ is lower than $-t_{\text{table}} = -1.74$; suggesting that mathematics learning outcomes of students having low spatial intelligence taught by integrative instructional model were significantly lower than those of taught by direct instruction, after controlling for initial competence, therefore hypotheses IV is accepted.

This finding agrees with a previous study of Gersten et al. (2009) in Zhang (2017) which emphasized that direct learning model is more effective given to students who have learning disabilities. Students who have low spatial intelligence will be more effective when taught using a teacher-centered guided learning model (Lambert & Tan, 2017). Students who have low spatial intelligence taught by an integrative learning model that requires students to be active will make students do not like activities that are creative and explorative, lazy and demotivated in learning. Geometry learning is very closely related to students' spatial intelligence; students who have high spatial intelligence, with effective learning models will be easier to build mathematical knowledge than students who have low spatial intelligence (Boaler, et. al, 2016).

CONCLUSION

This study summaries: Of the two instructional models being studied (i.e., integrative and direct instructions), the mathematics learning outcome of students who were taught

by integrative instructional model was higher than direct instruction, after controlling students' initial competence; There is an interaction effect between instructional model and spatial intelligence on mathematics learning outcome after controlling for initial competence; Mathematics learning outcome with integrative instructional model of students having high spatial intelligence is higher than direct instruction, after controlling for initial competence; Mathematics learning outcome with integrative instructional model of students having low spatial intelligence is lower in comparison to direct instruction, after controlling for initial competency.

RECOMMENDATIONS

The following recommendations were produced based on the results of this study as follows: (1) In order to improve students' mathematics learning outcomes, integrative learning model is more suitable to be used, (2) In choosing a mathematical learning model, the teacher should pay attention to the individual characteristics of students, such as spatial intelligence and initial competence related to material being studied (3) Especially for students who have low spatial intelligence, the direct learning model is more appropriately applied in order to optimize students' learning outcomes, and (4) Further research is needed to apply integrative learning models to other materials in the field of mathematics at all levels of education, as well as further studying of the variables which may influence learning outcomes.

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