

DEVELOPMENT OF THE QUANTUM TEACHING MODEL USING IT- ASSISTED THE GRANDE FRAMEWORK TO IMPROVE 21 ST CENTURY SKILLS

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Abstract

This research aims to describe the validity of the Quantum Teaching Model in the GRANDE form and see the influence of this learning model on biology learning in high school and students' 21st century skills abilities by using technological media. The use of technology in the world of education today has changed the way students learn and plays an important role in the era of the industrial revolution 4.0. This research is research and development that begins with the validity of the Quantum Teaching Oriented GRANDE Model in Biology learning and testing the effectiveness of the model. The subjects of this research were teachers who taught Biology subjects, students in class XI Biology High School (SMA), and the Biology learning curriculum. The development model in this research is the Plomp (2013) development model which consists of the Preliminary Research, Prototype and Assessment stages. This type of research is systematic, flexible, and follows the learning model development techniques studied. Data collection uses interview guides, questionnaires and effectiveness test results in the form of 21st century skills. The type of data used is quantitative data obtained from questionnaires, observations and learning outcomes. Data were analyzed through the stages of data preparation, data reduction, data processing, and drawing conclusions. The development of a Learning Model in the form of a Quantum Teaching Oriented GRANDE framework for Biology learning that has been produced has a validity level of the model book of 3.89 in the valid category, the validity of the teacher's book is 3.96 and is in the valid category. category valid category. The validity of student books is 4.09 and is included in the valid category. The average result of the Effectiveness Test using the GRANDE framework quantum teaching model was 82.3, indicating that students' 21st century skills increased

Keywords: Grow, Replay, Analysis, Narration, Demonstration, Evaluation Quantum Teaching, Validity, Efektifitas.

INTRODUCTION

Currently we are facing the fourth industrial revolution known as industrial revolution 4.0. The development of science and technology is a fundamental basis for determining the quality of life of a nation (Ragulina et al, 2019). Everything has become limitless and limitless due to the development of the internet and digital technology. This era has influenced many aspects of life, one of which is the world of education (Fisk, 2017). Education in the era of industrial revolution 4.0 is not enough to just emphasize the achievement of knowledge as a product, but must also emphasize various dimensions of life skills through the use or application of digital and internet technology known as cyber systems (Pozdnyakova, 2019).

One of the main indicators for achieving competence in this century is progress in science and technology. The rapid changes in the world of work due to globalization and revolution in the fields of information technology and science require anticipation and evaluation of the competencies needed by the world of work. This evaluation is

important so that the world of higher education cannot be separated from the real world of work in society (Hardini, 2012). Dafik's research results (2016) found that there was a gap between the education system and the world of work in Indonesia, namely that the graduates produced did not match the needs of job users. Responding to this, Wasitohadi (2019) stated that the world of education needs to continue to be updated by making innovations in order to solve educational problems effectively. Learning needs to create innovations in learning that lead to the output produced. In general, educational innovation is divided into six groups; 1) educational media and technology; 2) learning/pedagogical techniques; 3) curriculum; 4) education system; 5) evaluation; and 6) administration and management (Santoso, 2019).

On the other hand, Sujana, A & Rachmatin, D. (2019) emphasized that the benchmark for superior and quality graduates needed by the world of work is reflected in their competencies which include problem solving, critical thinking, creativity, communication skills, collaboration and digital literacy. To create these superior graduates, the role and responsibility of educators plays an important role in creating an active, conducive and effective learning environment for student development. There are many ways that can be done to answer the challenges of learning in the 4.0 era and the demands of the graduates above, including by carrying out various innovations in the learning carried out. One of them is choosing and implementing the right learning model according to the learning objectives and characteristics (Soh and Osman, K, 2010).

Biology is a branch of science that has experienced significant changes in the era of industrial revolution 4.0. Biology studies living creatures, both humans, animals and plants (Trianto, 2013). The changes that occur in biology learning are changes in perspective towards the concept of biology learning itself. Sumarni (2020) stated that most students consider biology lessons as rote lessons so that in class learning students only take notes and listen to the teacher's explanations. Student motivation and learning outcomes in learning tend to be low because students who do not have motivation tend to get low learning outcomes. The desire to be able to master these competencies requires real examples that are observed in addition to demonstrations carried out by teachers in class. This research aims to see the effectiveness of using the GRANDE form of Quantum teaching model to improve 21st century skills by utilizing information technology.

The GRANDE quantum teaching model by utilizing information technology is considered suitable for creating an integrated collaborative learning atmosphere in accordance with the demands of 21st century learning skills which require students to think critically, creatively, communicate and be able to collaborate in learning. The previous model that existed was the Quantum Teaching model using the TANDUR framework. This is supported by dePorter (2010) who states that active and creative learning models come from adherence to learning principles that enable students to solve problems with active participation during the learning process. The GRANDE quantum teaching model is suitable for the characteristics of high school students aged 15-17 years, because they are considered able to develop ideas through group discussions and independent study and are able to study various learning elements in biology subjects (Dewey, J. 1938).

The researcher's modified GRANDE form of quantum teaching model was taken from the basis of Quantum Teaching learning which is considered capable of improving 21st century skills which were developed into a new learning model by correcting existing weaknesses. So development is carried out on syntax, support systems and reaction principles that are integrated with the latest scientific developments related to improving 21st century skills by using information technology. This model is the GRANDE form of quantum teaching model (Grow, Replay, Analysis, Narration, Demonstration, Evaluation)

Several previous studies have also applied the quantum teaching model in the form of TANDUR but have not utilized technology in the learning process, such as research conducted by Sambu (2016) regarding the application of this model to elementary school mathematics learning using the TANDUR framework. Rohmalina (2018) research on the influence of TANDUR framework learning early childhood education programs. The research conducted has not integrated student center learning and has not constructed 21st century capabilities.

The application of the modified active learning model of creative learning invites students to work together with other people to communicate the problems contained in the material so that solutions are obtained and reflect on what has been learned and the use of learning videos from the information technology used. In addition, Harris (2002), McGrath (2002) and Solomon (2003) argue that students can become more active in the search and decision making process by improving their critical thinking skills.

One learning model that can be used to overcome the above problems is an active learning model that is modified using the quantum teaching model using the GRANDE framework by utilizing information technology in the form of learning videos. These steps were introduced by De Porter (2006) and modified with the concept: Grow, in this case students will be given keywords related to lecture material to grow their critical and creative thinking towards the material that day. Students can explore knowledge and learning experiences about the material by integrating the environment and technology in accordance with current developments in science and technology, so that the application of technology is not only for obtaining information, communication, but also social skills, learning abilities, and having skills. Critical, creative and inspiring thinking attitude (Akbar S, 2017). By applying this syntax, educational interactions between educators and students will be seen.

Replay, in this syntax, students are given the opportunity to express opinions, ask questions, answer or convey opinions about the material they have obtained from extracting knowledge and understanding of the material and utilizing information technology from videos shown related to the subject matter so that students are trained to improve how to interact and communicate. Good at conveying information.

Analysis, providing experience to students and providing opportunities for students to utilize the brain to explore knowledge. Students will analyze or connect about the material they have found with information from other students by thinking critically, creatively and innovatively. In this case students are required to be able to reflect on the process with learning experiences so that they are able to solve various types of problems related to the material in an innovative way. So that students are able to clarify various points of view and lead to better solutions related to learning materials.

Narration, this provides an understanding of naming an object, providing identity, sorting, and defining. Naming is built on the knowledge and curiosity of students. This syntax provides an understanding of the relationship between the information about the material obtained and the arguments resulting from the analysis that can be defined. Described about the material that produces a conclusion that becomes the lesson on that day, so that a decision can be taken in solving a problem related to learning material.

Demonstrations, students are given the opportunity to explain and present the results of their thoughts and knowledge obtained from the internet in the form of learning videos related to the material. Students will communicate the new ideas they obtain to friends effectively. These ideas are combined and input and feedback from the group is combined into a conclusion on the lesson material.

Evaluation, at the end of learning an evaluation test will be given to students to see how their understanding of the learning material that day, both orally and in writing. Those who answer the questions correctly and correctly will be rewarded as proof that they have played an active role in learning. Based on the description above, this study will design the GRANDE learning model (Grow, Replay, Analysis, Narration, Demonstration, Evaluation)

The implementation of the active learning model modified from creative learning invites students to work collaboratively with others to communicate the problems contained in the material so that solutions are obtained and reflect on what they have learned. In addition, Harris (2002), McGrath (2002) and Solomon (2003) argue that students can become more active in the search and decision-making process by increasing their critical thinking skills.

METHOD

This type of research is design research. The development design uses the Plomp model (2013) which has three stages, namely: preliminary research, the development or prototyping phase, and the assessment phase. This research has stages that are systematic, flexible and in accordance with the learning model development techniques that will be developed.

Preliminary Research Phase

At this stage, several stages of data collection are carried out, consisting of the needs and context analysis stage and the literature review stage. At the needs and context analysis stage, an analysis is carried out which includes analysis of the characteristics of the high school biology learning model, analysis of biology material, analysis of student characteristics, and curriculum analysis. The Literature review stage was carried out by analyzing the theories and concepts that support the development of the GRANDE model to improve 21st century skills in high school biology learning. At this stage, observations, interviews and distribution of questionnaires were carried out to teachers and students.

Development or Prototyping Phase

In this stage the researcher designs an initial prototype of the research product. There were three products made in this research, namely (1) model books, (2) teacher books, and (3) student books. At this stage, model design is carried out according to the rational components of the model and model components based on syntax, social

systems, reaction principles, support systems and instructional impacts. Product validation is also carried out at this stage.

Assessment Phase

At this stage, an effectiveness test was carried out to assess the quantum teaching model in GRANDE form during field tests applied to biology learning. The field test was carried out at SMAN 2 Gunung Talang and SMAN 5 Kota Padang with a sample size of 33 students and 6 teachers each from the control class and experimental class. Effectiveness test data is evaluated semi-summatively to obtain conclusions regarding whether the intervention meets predetermined specifications. Effectiveness testing was carried out through quasi experiments. a) Effectiveness test analysis was carried out using a normality test using the Kolmogorof Smirnof test with a significance value of (>0.05) with sample data from a normally distributed population. b) A homogeneity test was carried out on the variance of 21st century skills to prove that the two sample groups came from homogeneous variances. A Levene test was carried out with the hypothesis (>0.05) with a homogeneous data distribution. c) The T.test is used to see whether there is a difference in the treatment provided

RESULT AND DISCUSSION

1. Preliminary Research Phase

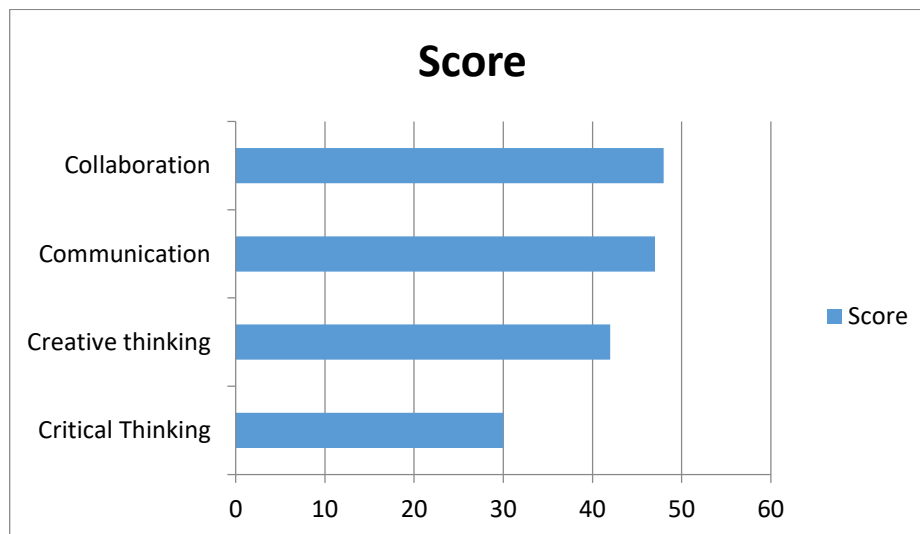
In the needs and context analysis stage an analysis was carried out which included an analysis of the characteristics of the biology learning model in high school, an analysis of biology material, an analysis of student characteristics, and an analysis of the curriculum. The expected characteristics are those that are relevant to the characteristics of learning that are able to face challenges in the 21st century. Students are expected to have learning skills that innovate in accordance with the demands of 21st century skills in the form of critical thinking, creativity, communication, and collaboration. Therefore the Quantum teaching-oriented GRANDE model in its syntax component follows the criteria of 21st century skills. Students need a learning model that is able to facilitate student learning needs to improve 21st century skills. So this GRANDE model in its syntax facilitates these needs. At this needs analysis stage an analysis was carried out which included: analysis of the characteristics of the high school biology learning model, analysis of biology material, analysis of student characteristics, analysis of the curriculum.

Based on the results of preliminary studies that have been conducted at SMA 2 Gunung Talang and SMA 5 Kota Padang, teachers generally still use conventional models in learning and have not actively involved students in learning activities. The results of interviews with teachers stated that teachers were not familiar with current learning models, learning was still theoretical without involving students in learning so that biology learning activities had a low impact on students' 21st century skills because students only relied on the teacher as a source of information. The results of the questionnaire show that conventional learning has not shown the ability of students in 21st century skills (Table 1).

Table 1: Results of 21st century skills of students

No	Variable	Indicator	Score (%)
1	Critical Thinking	Deductive Reasoning	30/%
		Inductive Reasoning	
		Using Systems Thinking	
		Make decision	
		Problem Solving	
2	Creative Thinking	Creative Thinking	42 %
		Creative Work With Others	
		Implement Innovation	
3	Communication	Explaining Thoughts and Ideas	47%
		Listen Effectively	
		Using Communication Skills	
		Using Media and Technology	
		Communicating Effectively	
4	Collaboration	Respect for others	48%
		Problem Solving Ability	
		Contribution	
		Average	41,75 %

(Partnership, 2011)



Graph 1: 21st century skills

Based on the results of the questionnaire above, it can be seen that the results of students' 21st century skills with an average of 41.7% are in the low category, thus there is a need for a learning model design that is able to accommodate 21st century skills by involving students fully in every learning activity.

Curriculum Analysis

This is done so that the resulting learning model is in accordance with the characteristics of the applicable biology learning material and is related to the supporting components of the model. The curriculum used is the 2013 curriculum. Based on Permendikbud No. 21 of 2014 concerning content standards in the 2013 curriculum that in addition to learning focusing on

achieving competence, learning must also develop 21st century skills (sani R, 2014).

Analysis of Student Characteristics

Student characteristics analyzed from the questionnaire are student learning styles, learning methods, reading sources and students' cognitive stage. Recapitulation of student responses to the student characteristic questionnaire can be seen in the following in table 2:

Table 2: Results of the analysis of student characteristics questionnaire responses

No	Variable	Indicator	Score (%)
1	Learning Style	Audio	20 %
		Visual	35 %
		Audio Visual	20 %
		Kinesthetic	25 %
2	Study Method	Demonstration	10 %
		Discussion	20 %
		Problem Solving	10 %
		Collaboration	15 %
		Lecture Method	45 %

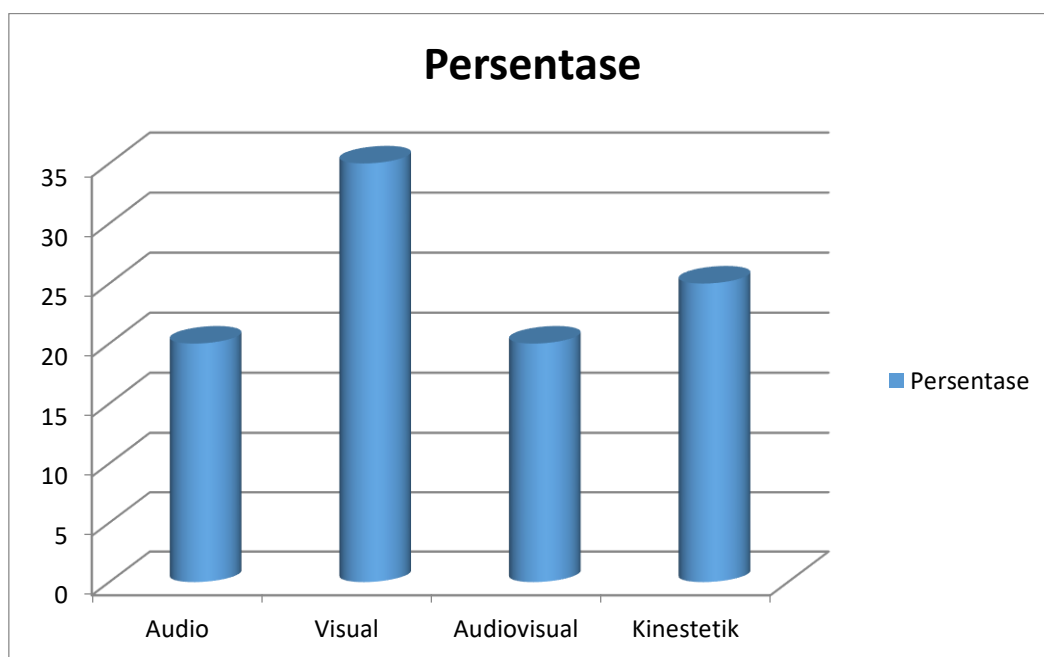


Figure 2: Learning Style

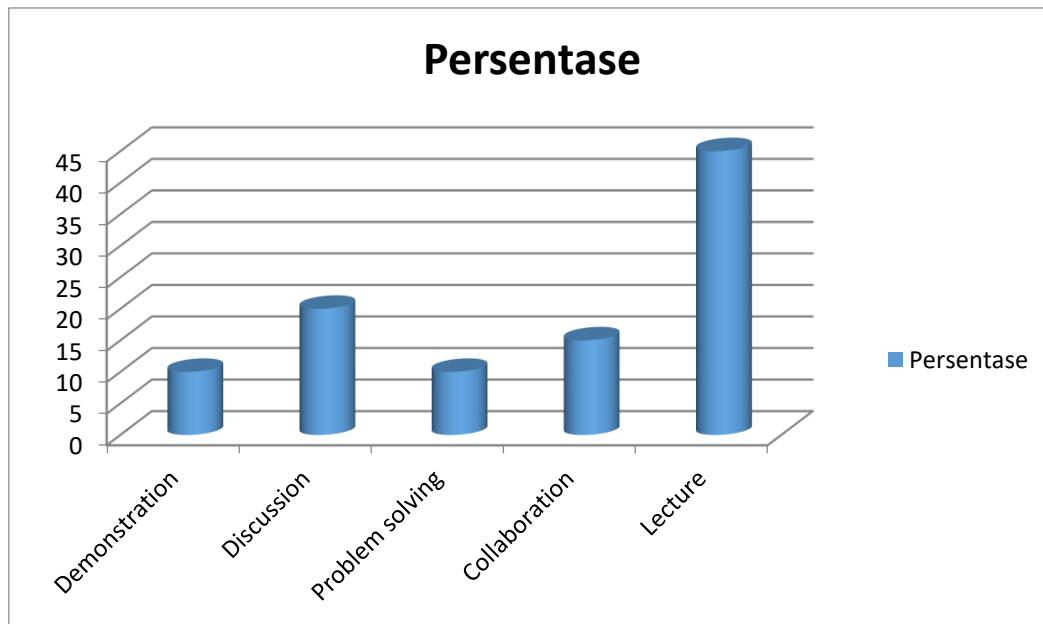


Figure 3: Learning Method

Based on the analysis of student characteristics above, it can provide an overview of product design and content coverage on product support systems in the model to be designed. The model developed is in accordance with student characteristics so that it is able to facilitate students such as language that is easily understood, the use of letters, the placement of material which is used as the basis for improving 21st century skills.

LITERATURE REVIEW

Literature review is carried out by analyzing the theories and concepts that support the development of the GRANDE model to improve 21st century skills. At this stage related theories and concepts are analyzed, selected, analyzed so that they become the basis for the development of the GRANDE model. The theory related to the GRANDE model is the theory of constructivism. Cognitive psychology focuses on students' rules about building new knowledge so that this theory is called constructivism which has several components as follows: students build their own understanding, learning can be built through previous understanding, learning is gathered from social interaction, learning with real experiences to build meaningful learning. The literature used is used as a basis for the development of reaction principles, social systems, syntax, support systems and instructional impacts, accompanying impacts and determines the characteristics of the model (Simbarashe, 2016).

The principle of reaction in the GRANDE model is to facilitate learning models, foster student learning motivation, evaluate the learning process, activate students to self-reflect and provide guidance. In this case the teacher acts as a facilitator, motivator and evaluator. The syntax of the model consists of Grow which provides reflection on knowledge by providing keywords about the material which is a cognitive process that occurs in the individual for an experience that has been experienced, Replay is a form of student understanding of the knowledge that has been explored by observing research

results which are then revealed in the form of opinions, questions or understanding, Analysis will be carried out by students by analyzing and connecting the knowledge they get with the subject matter by thinking critically and creatively, Narration by describing the material that produces a conclusion, so that a decision can be taken to solve the learning problems on that day, demonstrations will be carried out with interpret the knowledge and results of students' thoughts by communicating the ideas they get related to the subject matter. Evaluation is conducted to see the ability of students to understand the material that has been studied.

The support system in the GRANDE model is in the form of model books, teacher books and student books which are expected to make it easier for teachers and students in every learning activity. Before being used, the book is validated by experts and practical by expert practitioners so that a valid and practical book is obtained. The expected instructional impact of this model is to improve students' 21st century skills while the accompanying impact that will occur with the application of this model is that students are able to reinvent various biology concepts and realize how important the benefits of biology are in life.

Based on needs and context analysis, as well as literature reviews, it is known that learning biology is an effort to assist students in constructing biological concepts or principles through active involvement of students in learning activities in an effort to improve 21st century skills through the GRANDE learning model.

2. Development or Prototyping Phase

To measure the calculation and the final value of validity, the formula from Sugiyono (2014) is used. The following describes the results of the validity of the GRANDE model Development in Biology learning. The numbers entered in the table represent the validator's assessment score.

Table 3: Data on the Validation of GRANDE model Books by the Validator

No	Indicator	Average	Category
1	Book Formats	3.50	Valid
2	Book Contents	4.10	Valid
3	Language	4.15	Valid
4	graphics	4.07	Valid
5	Models syntax	3.80	Valid
6	Social System	3.89	Valid
7	Reaction Principle	4.20	Valid
8	Support System	3.55	Valid
9	Companion Impact	3.75	Valid
	Average	3.89	Valid

The validation results of the Quantum Teaching-oriented GRANDE Model Book in Biology learning assessed by the validator in Table 4 can be seen that the average validation result in general is 3.89 with a valid category. From the indicators assessed, it is known that the indicators for book format, book content, language, graphics, model syntax, social system, reaction principle, support system and accompanying impact have the same interpretation as the valid category. From

the results of the overall validity test, it shows that the Quantum Teaching Model Book for Biology learning developed is very valid. Next, we will explain the results of the validity of the Quantum Teaching-oriented GRANDE Model Teacher's Book in Biology learning. The numbers entered in the table represent the validator's assessment score with a statement that this model book is suitable for use with interpretation referring to table 4:

Table 4: Interpretation of validation results

Average	Interpretation
$X > 4,2$	Very Valid
$3.4 < x \leq 4.2$	Valid
$X > 2,6 - 3,4$	Quite valid
$X > 1,8 - 2,6$	Invalid
$X < 1,8$	Invalid

(Widyoko, 2017)

Table 5: Data on the Validation of the Use of GRANDE model Teacher Books in Biology learning by the Validator

No	Indicator	Average	Category
1	A Material Suitability	3,85	Valid
2	Language	4,02	Valid
3	graphics	4,01	Valid
Average		3,96	Valid

Based on Table 5 it can be seen that the validation results of the teacher's book on the Development of the Quantum Teaching-oriented GRANDE Model in Biology learning by the teacher as assessed by the validator is 3.96 with a valid category. From the results shown in the table it can be seen that the teacher's book has been revised according to the validator's input which is generally in the valid category.

Table 6: Data Validation Results of GRANDE model Student Books in Biology learning by Validator

No	Indicator	Average	Category
1	A Material Suitability	4.20	Valid
2	Language	3.98	Valid
3	graphics	4.10	Valid
Average		4.09	Valid

From the validation results of the Student Book for the Development of the GRANDE model in Biology learning assessed by the validator as shown in Table 6, it can be seen that the validation value is 4.09 in the valid category. The content feasibility indicator is 4.20 with a valid category. language has a validation result of 3.98 with a valid category. and the validation result graphic is 4.10 with valid.

3. Assesment Phase

At the assessment stage, a test of the effectiveness of the quantum teaching model within the GRANDE framework was carried out using information technology in biology learning to see the improvement of 21st century skills. The results of the 21st century skills effectiveness test can be seen in table 7 below:

Table 7: The results of the 21st century skills effectiveness test

21st century skills	SMAN 2 Gunung Talang		SMAN 5 Kota Padang	
	Experiment	Control	Eksperiment	Control
Critical Thinking	86.92	78.17	86.71	76.43
Creative Thinking	83.44	69.90	86.71	76.42
Communication	82.67	67.67	82.43	65.71
Collaboration	74.72	69.72	75.48	70.00
Average	81.94	71.37	82.83	72.14

The table 7 above can show that the 21st century skills possessed by students using the GRANDE model of quantum teaching are higher than those who do not use the GRANDE framework model by utilizing information technology. The GRANDE element in the quantum teaching model is able to stimulate students' critical, creative thinking, communication and collaboration. In this case, students are asked to identify and explore knowledge to solve problems related to subject matter from various information sources using information technology and to be able to analyze the information obtained so that it can be narrated for presentation in front of the class. The 21st century skills data is then used in the prerequisite test to see the normality and homogeneity of the data group. Normality test results can be seen in table 8.

Table 8: Normality test results of the 21st century skills

21st century skills	School	Class	N	Average	Sig
Critical Thinking	SMAN 5 Padang	Exsperiment 1	33	86.70	0.312
		Control 1	33	76.40	0.166
	SMAN 2 Gunung Talang	Exsperiment 2	33	86.91	0.352
		Control 2	33	78.16	0.109
Creative Thinking	SMAN 5 Padang	Exsperiment 1	33	85.63	0.091
		Control 1	33	70.90	0.252
	SMAN 2 Gunung Talang	Exsperiment 2	33	82.50	0.244
		Control 2	33	69.98	0.488
Communication	SMAN 5 Padang	Exsperiment 1	33	82.42	0.105
		Control 1	33	65.71	0.063
	SMAN 2 Gunung Talang	Exsperiment 2	33	82.66	0.200
		Control 2	33	67.66	0.188
Collaboration	SMAN 5 Padang	Exsperiment 1	33	75.47	0.436
		Control 1	33	70.00	0.085
	SMAN 2 Gunung Talang	Exsperiment 2	33	74.77	0.098
		Control 2	33	69.72	0.190

The results in table 8 show that the distribution of data on 21st century skills achievements in the experimental and control classes is normally distributed. The next prerequisite test is a homogeneity test which can be seen in table 9. As follows:

Table 9: The Result homogeneity test of the 21st century skills

21st century skills	School	Class	Sig
Critical Thinking	SMAN 5 Padang	Exsperiment 1	0.081
		Control 1	
	SMAN 2 Gunung Talang	Exsperiment 2	0.067
		Control 2	
Creative Thinking	SMAN 5 Padang	Exsperiment 1	0.091
		Control 1	
	SMAN 2 Gunung Talang	Exsperiment 2	0.296
		Control 2	
Communication	SMAN 5 Padang	Exsperiment 1	0.054
		Control 1	
	SMAN 2 Gunung Talang	Exsperiment 2	0.873
		Control 2	
Collaboration	SMAN 5 Padang	Exsperiment 1	0.505
		Control 1	
	SMAN 2 Gunung Talang	Exsperiment 2	0.714
		Control 2	

The results of the analysis identified that the data from all groups from the experimental and control classes had a homogeneous data distribution. Next, a hypothesis test was carried out using the independent sample t-test. The results of the test analysis can be seen in table 10. Below:

Table 10: results of the hypotesis of the 21st century skills

21st century skills	School	Class	Sig
Critical Thinking	SMAN 5 Padang	Exsperiment 1	0.00
		Control 1	
	SMAN 2 Gunung Talang	Exsperiment 2	0.00
		Control 2	
Creative Thinking	SMAN 5 Padang	Exsperiment 1	0.00
		Control 1	
	SMAN 2 Gunung Talang	Exsperiment 2	0.00
		Control 2	
Communication	SMAN 5 Padang	Exsperiment 1	0.00
		Control 1	
	SMAN 2 Gunung Talang	Exsperiment 2	0.00
		Control 2	
Collaboration	SMAN 5 Padang	Exsperiment 1	0.010
		Control 1	
	SMAN 2 Gunung Talang	Exsperiment 2	0.017
		Control 2	

The results of this analysis indicate that there is a difference in the use of the GRANDE form of quantum teaching model and the quantum teaching model alone. The test results prove that the model is effective for improving 21st century skills.

DISCUSSION

Activities: Developing a quantum teaching model in the form of the GRANDE framework by utilizing information technology in Biology learning can produce student activities, skills and understanding of concepts. So that the learning process becomes interactive, innovative, challenging and fun. According to Joyce (2016), a support system is a device or facility that supports the implementation of the learning process. For example, to apply a learning model that is used to see students' imaginative /

creative abilities, a learning model is needed that describes students' imaginative / creative abilities. Instructional impact refers to imagination/creativity abilities and learning outcomes, while accompanying impact refers to the experience or skills acquired by students.

The results of a preliminary study by conducting needs and context analysis show that the learning carried out by teachers is still teacher-centered and does not involve students in actively participating in learning so that it does not motivate students to develop 21st century skills, in this case it is necessary to develop a learning model that is able to facilitate students to improve 21st century skills by involving information technology to explore existing knowledge.

Based on the results of the needs and context analysis and literature review, it is known that biology learning is an effort to help students construct concepts or principles through active involvement of students in learning activities by exploring students' knowledge and presenting the real world to improve students' abilities. '21st century skills. However, based on the reality in the field, biology learning has not been able to improve students' 21st century skills because learning does not fully involve students actively, the model used is still conventional and there is a lack of instilling 21st century skills in students. For this reason, a biology learning model is needed that is adapted to the characteristics of high school students, where this model is able to accommodate all 21st century skills in students. Thus, one effort that can improve students' 21st century skills is to develop a model that accommodates all of these competencies. So that learning becomes more meaningful for students. Through the quantum teaching model in the form of the GRANDE framework, students can solve biological problems related to everyday life critically, creatively and innovatively. Furthermore, through this model, it is hoped that students will be able to develop collaborative learning interaction patterns so that students' communication skills can develop optimally. The GRANDE framework model should be developed to improve 21st century skills by involving information technology, where every student must master 21st century skills to be able to compete in the future.

Based on the results of the validation carried out by the validator on the development of the teacher's book. Development of the GRANDE model in Biology learning which was developed in the form of 1) S Development Learning Model Book. Teacher's book. Development of the GRANDE framework model in Biology learning; 2) Development of a Teacher's Book, Development of the Quantum Teaching Model in Biology learning; and 3) The Student Book for the Development of the Quantum Teaching Model in Biology learning is included in the valid category. The validation carried out in this research emphasized content validity and construct validity. Content validity is declared valid by the validator because the learning product developed is in accordance with the material that should be presented. It can be said that the content validity of this learning product can be justified because it has been assessed by experts. Construct validity is also declared valid by the validator because it is a learning product construct. The development of the teacher's book, Development of the GRANDE Model in Biology Learning, has met the requirements for preparing learning tools. This is said to be valid if the instrument can be used to measure what it should measure." The validation results show that the resulting learning tools have been tested for quality and declared valid by the validator. The next step is the trial phase. In the trial activity, users carry out the GRANDE stage in stages. The main data to see effectiveness is data on the results of 21st century skills observed during learning

using the Quantum Teaching model using the GRANDE framework by utilizing information technology. Critical thinking assessment is carried out using an assessment rubric, while creative thinking is carried out at the grow, replay and analysis learning stages. At the narrative and demonstration stage the teacher has divided students into heterogeneous groups. Give them the task of analyzing, defining and concluding solutions to problems related to learning material, so that observers can observe students' creative thinking skills. Students can develop their creative ideas in groups and develop problem solving abilities (Coaley, K. (2010).

Communication assessment can be seen at the narration and demonstration stages through presentations of observation results and sources of information that have been prepared in the form of reports and socializing them to other group friends. Cangara (2007) said that oral communication can be seen from the way of presentation, listening and body language. Meanwhile, collaborative assessment can also be seen at the narration and demonstration stages when students work on assignments in groups and collaborate in conveying ideas and thoughts.

CONCLUSION

This research aims to develop a GRANDE form of quantum teaching model by utilizing information technology which aims to improve students' 21st century skills. Development was carried out using the Plomp model through the Preliminary research, Prototyping Phase, and Assessment Phase stages. The results of the development are model books, teacher books and student books. In this case, an initial analysis is carried out for initial research, followed by product design and validation process. Once it is valid, a field test is carried out to see the effectiveness of using the GRANDE form of quantum teaching model by utilizing technology. From the results of the research carried out, product validation results were obtained with valid criteria and were declared suitable for further testing. In field trials, it was found that there was an increase in students' 21st century skills using the GRANDE form of quantum teaching model by utilizing information technology. This shows that the model can be used to improve students' 21st century skills, therefore, in future research similar research can be carried out on various subjects to assess its impact on individuals with different characteristics. Seeing the limitations of this research in only one subject, further research should consider expanding it to other subjects.

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