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Multimedia Courseware for Interactive Teaching and Learning: Students' Needs and Perspectives

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Abstract: Education faces many new challenges in meeting the demands of teaching and learning for the 21st century. One of the new challenges is to integrate ICT (Information and communication technologies) in teaching and learning as a means of delivering alternative teaching. Multimedia technology, for example, has the potential to transform a traditional classroom into an unlimited imaginary world. This paper report on development and evaluation of a multimedia courseware for Design and Technology (RBT). An interactive CD was developed using the Adobe Flash CS6 software. Alpha and Beta testing have been carried out in the development process. 6 experts were assigned to evaluate the functionality of the interactive CD. In order to identify the usability of interactive CD, 103 respondents were involved in the survey by filling four-point Likert scaled questionnaire. The findings show that, the level of interactive CD usability is at a high level. Based on this study, there are positive effects that we can see based on the use of multimedia elements in the education system. The meaningful benefits of using multimedia elements for learning include the presentation of various learning styles. The presentation of information usually integrates multimedia elements such as text, graphics, audio and video.

Keywords: Interactive courseware; tutorial learning strategies.

1. Introduction

Design and Technology (RBT) is a core subject in the Integrated High School Curriculum (KBSM) for Form 1 to Form 3. This subject aimed to provide students with basic skills to enable them to manage their daily life more proactively in the complex and constantly changing technology and commerce world. The main aims of this subject is to produce self-reliant human beings, to recognize technology and economy as well as to be creative, self-conscious and confident in today's complex industrial technology.

The diversity of teaching aids can be used as a new teaching strategy today. The conventional approaches in teaching and learning are now seen to be no longer rational to apply in this versatile era. Hamdan and Mohd Yasin (2010) stated that teacher-centered learning in one-way has led to producing passive learner students. It also supported by Azman et al. (2014), one-to-one teaching causes students to easily get bored and slightly disintegrate students to learn. Therefore, to improve the quality of education, learning methods need to be modernized and upgraded through integration of ICT (Information and communication technologies) teaching and learning.

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Integrations of this ICT in teaching and learning is seen in line with the 21st century learning (PAK-21). For example, by adapt a few ICT platforms like websites, blogs, internet, intranets, interactive CDs, CD-ROMs and videos. The study conducted by Lee & Yeap (2005) shows that the use of computers that contain Interactive CD software is an effective educational tool to support and enhance teaching and learning activities in the classroom.

Interactive CDs are known as effective computer-based learning software (Alessi & Trollip, 2001). This special software is designed to contain instructional instructions. In addition, the Interactive CD is the latest term for computer-based learning in the delivery of teaching in interactive mode. The combination of text, audio, graphics, animation and video elements using a computer as a presentation control enables the interactive communication process to be more effective (Harun & Tasir, 2000). It was supported by Abdul Rahman (2005) where multimedia technology incorporating text, graphics, animation and sound elements makes the software more attractive for students to use and help the teaching and learning processes to improve the quality and productivity of educators towards Vision 2020. In addition, the teaching and learning process can take place in exciting situations. Therefore, the purposes of this study to see the usefulness and suitability of the Interactive CD for Design and Technology (RBT) subjects. Specifically, to identify the functionality and usefulness of Interactive CD as teaching aids for RBT subjects.

2. Methodology

The research design for this study were product design approach with ADDIE Model as a guideline for the design and development process. Then quantitative method with questionnaire distribution were used to identify the usability of the Interactive CD that has been developed earlier.

2.1 ADDIE Model

In developing an Interactive CD for RBT, developers have chosen the ADDIE model as a guideline in design and development process. According to Harun et al., (2003), this model is one of the design instructions which is often the basis for other design instruction models. Therefore, developers used the ADDIE Model to develop an Interactive CD to provide a systematic process. There are several phases of work that developers had go through using the ADDIE Model i.e. the analysis, design, development, implementation and evaluation phases.

2.1.1 Analysis Phase

The analysis phase focuses on the process of identifying problems to be resolved. In the analysis stage, developers had collected the data to identify students' backgrounds, students learning styles and student needs to ensure the requirements needed. This phase involved several steps of work starting with requirement analysis, target analysis, task analysis and instructional analysis.

2.1.2 Design Phase

The design phase is the process of transferring information from an analysis phase to a physical sketch or draft that will be used during the Interactive CD development process. In other words, this phase is very important because it describes the entire Interactive CD software that will be developed. Alessi and Trollip (2001) stated that this procedure can reinforce the findings that with the strategies being carried out, it is able to perform the same sequence without regard to the students' ability. At this stage, several steps will be taken such as the determination of software development objectives, software contents, software objectives, software development planning and storyboards as below:

- Development Interactive CD Objective
  The development objective of the Interactive CD needs to be in an instruction for the purpose of improving the achievement or the level of mastery of the students in the subject. Therefore, the objective of the Interactive CD development is to produce an interactive teaching media to help students to easily understand.
- Selected Syllabus Subjects
  Developer has chosen Form 2 RBT subjects to develop Interactive CDs. This is because, there is no Interactive CD specifically for elective choice for this subject either from the manufacturer or outside of the Ministry of Education. In this regard, the Interactive CD to be developed can also be used as a reference material and teaching aids.
- Interactive CD Learning Objectives
  Objective determination begins with the Form 2 RBT syllabus curriculum required by the Ministry of Education.
- Teaching Strategies
  The findings from previous target analysis found that the dominant style of students learning was pragmatic. Students are more practical and concerned about the truth than their existing theories, laws or principles. Therefore, the strategy in the tutorial approach was selected and will be implemented in the development of this Interactive CD. This is because, this tutorial method is able to present information and contents of new lessons. It is consistent with Harun et al., (2003), where this tutorial strategy approach will teach students about the theory,

concept or principle of something. Hence, as a whole the approach of this tutorial strategy can complement the dominant learners with pragmatic learning styles.

- Media Interactive CD Selection
  In the development of this Interactive CD, some media were used like video and real picture to show the real process. The interactive CDs that have been developed are systematically designed media based on the Syllabus so students can learn easily, exciting and fun. The use of thin, lightweight, easy-to-use CD-Roms, cheap and easy to carry makes it the appropriate media in this study.
- Hardware and Software Requirements
  The following equipment and software are required to ensure the smooth running of the interactive CD development process: i. Computer, ii. Laptop, iii. Scanners, iv. Cell phone, v. Mouse, vi. Adobe Flash CS6, vii. Adobe Illustrator.
- Interactive CD Display Study Review
  The software that had been used in this Interactive CD is Adobe Flash CS6 as a temporary authoring medium for the enhancement and filling of its contents so software like Adobe Illustrator is used for graphics and film modifications. Multimedia elements such as text, graphics, audio, animation and video are also required to be compatible with computers that students will use.
- Storyboard
  Contents that had been meet the curriculum requirements were presented on storyboard before going through to the development process. Construction of this storyboard had going through several phases of construction and evaluation and followed by improvements.
- Design Interface
  Interface design is one of the important elements to attract students to use a software. It is a screens design that allows students to connect and explore interaction. Accordingly, developers use a harmonious colour based on natural colours. Contrast and soft colour combinations make the layout of the presentation information are much easier to understand.
- Interactive CD Storyboard Flow Chart
  The connection of each screen to the storyboard for this study starts with an introduction screen. On the introduction screen there are title menus, learning outcomes, montages and user guides. The learning outcomes menu is a menu that displays the learning objectives that students need to achieve. The montage menu is the first video to show briefly the information contained in the Interactive CD. For the user guide menu, it guides students about the navigation contained in the Interactive CD so that students do not go astray while using the Interactive CD. Meanwhile, for the title menu it is linked to the topic to be learned. Slides of sub-topics are linked to each other allowing students to use them on a regular basis.

2.1.3 Development Phase

The steps in this phase are to produce text, design of screen layout, build interfaces and activate navigation buttons. Text creation is based on the content information obtained from the determination of the contents of the interactive CDs that have been discussed. Graphics usage comes with content information. The construction of the presentation screen layout is according to a previously created storyboard. Animation is generated on this phase as a result of feedback received. Interfaces and interactivity are also enabled. After that, multimedia elements such as audio, animation and video are combined in every presentation screen.

The assessment process consisting of Alfa testing is carried out by field and media experts for the developed Interactive CD to meet the criteria set out in the design phase. Improvements are carried out in stages after feedback from the testing is received. A total of six field and media experts are involved in Alpha testing. To ensure the smooth running of the study, the list of tasks has been set before the development, during development and after development.

2.1.4 Implementation and Evaluation Phase

Interactive CDs for the subjects are assessed by experts and students as respondents in Beta testing. A total of three field experts (teachers) and three media experts (Multimedia lecturers) are involved in getting feedback on the functionality of this interactive CD. Also, a total of 103 students from Form 2 who took the RBT subjects from SMK Taman Putri have answered the questionnaire to determine the level of usefulness of the interactive CD.

2.1.5 Pilot Study

Pilot study was conducted to determine the reliability of questionnaire. This study was conducted on Form 2 students taking RBT at SMK Taman Kota Kulai. This is because the population of the school has the same characteristics as the actual population of the study. Questionnaires should be conducted on the respondents who are equivalent to the actual respondents through pilot studies (Talib, 2013). A total of 30 students from the school have been choose as respondents for this pilot study. The analysis of the questionnaire instrument has shown that high reliability with Cronbach Alpha

value is 0.880. The reliability level of questionnaire items is high if the Cronbach alpha value is 0.8 and above (Pallant, 2011). Therefore, the questionnaire that has been developed can be used in actual studies.

3. Results

The findings discussed based on the results of the expert feedback and questionnaires form the students. Data that had been collected were analysed in the context of usability and functionality of the Interactive CD in descriptive statistical analysis. An explanation of the percentage was based on the interpretation of the score percentage. Nordin, Saud & Subari (2008) use the table of interpretation of the percentage range to answer the question of their 2 studies in determining the score of visualization skills as shown in Table 1. The range between 61 and 100 shows a 'High' visualization score, the range between 41 to 60 is the 'Medium' level and the range from 0 to 40 indicates a 'Low' score.

Table 1- Interpretation of Percentage Score based on Visualization Skills Score Scores (Source: Nordin, Saud & Subari, 2008)

Score Percentage	Level of interpretation
81 – 100	High
61 – 80	
41 – 60	Average
0 – 40	Low

3.1 Functionality of the Interactive CD from Experts Perspectives

Data were analysed from the results of Beta testing by content and media experts. From the aspect of content and learning, experts agreed that the contents of the Interactive CD developed to meet the syllabus, can achieve learning objectives, conform to the learning objectives, the simple facts are provided by the developers and the order of content is properly organized. However, there is still doubt in linking the content with the existing knowledge of the students.

Based on the interactivity aspect of teaching, all experts agree that the Interactive CD presentation and teaching strategy are appropriate to the student's ability. Additionally, all experts agree that the tutorials used are appropriate to the topic, the software provides the opportunity to repeat the training, assist the teaching and learning process and be appropriate for self-learning. However, only two field experts can receive enough training to reinforce their understanding of the concepts of the students.

From the aspect of the software interface, data finds that all experts agree that the Interactive CD provided is interactive, easy-to-understand, easy-to-reach, has complete control panel, consistency and provision for students to stop at any time without the teaching and learning getting hindered by interactivity. While based on the multimedia elements aspect, the three experts agree on the appropriate colour selection, smooth animation animations, clear graphics, clear audio, clear video supplied, proper use of letters, clear text usage, integrated multimedia elements integration with teaching strategies, layout layouts layout, an exciting multimedia elements integration and all multimedia elements and work well.

Meanwhile form the Media experts, they evaluate on the functionality of this interactive CD and the technical aspects such as software and multimedia interfaces. All experts agree that the Interactive CD has clear instructions, works well, can be used without technical interruptions, in accordance with all computer systems, disturbed, durable, free from "bugs", not easy to crash, not "hang" if mistakenly handled and there are tutorials in the Interactive CD. But only one expert disagreed with the easy-to-use software because the sequence of navigational sub-topics that had a lot of slides needed to have link buttons at the beginning of the movement to retain student emotions in using this Interactive CD later. Besides, background music needs to be improved by loading music that can appeal to students.

On the aspect of the software interface, all experts agree that this interactive CD contains easy-to-understand interactive buttons, easy-to-reach interactive buttons, has a control panel, consistent interactive buttons, allowing students to stop at any time and Interactivity CD interactivity does not disturb the teaching and learning process.

3.2 Usability of Interactive CD as a tool (teaching aids) for RBT subjects

To identify the criteria in determining the suitability of this interactive CD, some of the features are emphasized which include aspects of content, teaching strategy aspect, presentation aspect and interaction aspect by students.

3.2.1 Interactive CD Usability Level from Content Aspects

Based on Table 2, it is found that almost all respondents agree that the degree of interactive CD usability in terms of content is high (99.6%). Based on the percentage of interpretation used, usability level from content aspect at a high value (99%). All students agree that the information in the Interactive CD facilitates students' understanding of the content of the lesson (100%), videos provided in Interactive CDs can be applied during practical work (100%) and pictures provided in Interactive CDs are related to existing knowledge students (100%). Students also agree that the information in the Interactive CD can be clearly communicated (99%) and the information contained in the Interactive CD helps students answer the questions well (99%) as shown in Table 2.

Table 2- Beta Testing Results for Contents Aspects

No.	Item	Frequency and Percentage (%)				%	Stage
		SD	D	A	SA		
1	Information in Interactive CDs can be clearly stated	0	1 1.0	44 42.7	58 56.3	99.00	High
2	The information in the Interactive CD facilitates understanding of the students on the content of the lesson	0	0	49 47.6	54 52.4	100.00	High
3	Videos provided in Interactive CDs can be used during practical work	0	0	25 24.3	78 75.7	100.00	High
4	The information in the Interactive CD helps students answer the questions well	0	1 1.0	42 40.8	60 58.3	99.00	High
5	The pictures provided in the Interactive CD are related to the existing knowledge of the students.	0	0	37 35.9	66 64.1	100.00	High
		Average Percentage				99.6	High

3.2.2 Interactive CD Usability Level from Teaching Strategy Aspects

Table 3 shows the level of usability of interactive CDs in terms of teaching strategies aspect. Based on the table, most of the respondents agreed that the usability from the aspect of the teaching strategy was high (97.43%). There are 6 items assessed from the teaching strategy aspects. Based on Table 3, almost all students agree that the teaching objectives suitable for learning (99.1%), tutorials are in accordance with the topics studied (99.1%), High Order Thinking Skills (HOT'S) quiz provides early exposure to students (98.1%), quizzes make students easy to understand about the content of the lessons (96.1%) and students have the potential to be creative through the activities provided (92.3%).

However, 8 students choose to disagree on items to be creative through the activities provided, 4 students disagreed on quiz items to make the students easy to understand the content of the lesson, 2 students disagree on the High Order Thinking Skills (HOT'S) quiz item giving early exposure to students and one disagrees with the tutorial method item according to the topic studied and the quiz provided to strengthen the student with the topic studied.

Table 3- Beta Testing Results for Aspects of Teaching Strategy

No.	Item	Frequency and Percentage (%)				%	Stage
		SD	D	A	SA		
6	The teaching objectives are written for students to know what they are learning	0	0 1.0	53 51.5	49 47.6	99.1	High
7	The tutorial method is according to the topic studied	0	1 1.0	43 41.7	59 57.3	99.1	High
8	Students have the opportunity to be creative through the activities provided	0	8 7.8	36 35.0	59 57.3	92.3	High
9	The quiz makes students easy to understand about the subject matter	0	4 3.9	47 45.6	52 50.5	96.1	High
10	High Order Thinking Skills (HOT'S) quizzes give early exposure to students	0	2 1.	36 65	35 63.1 9	98.1	High
11	The provided quizzes reinforce the students with the topics they learned	0	1	38 64	36.9 62.1	99.0	High
		Average Percentage				97.43	High

3.2.3 Interactive CD Usability Level from Teaching Presentation Aspect

Based on the Table 4, most of the respondents agreed that the degree of interactive CD usability in terms of teaching presentations is high (97.43%). The results showed that there are 6 items in terms of teaching presentations. All students agree that the videos that are used make it easier for students to understand the process of releasing fish (100%) and user support can help students to explore the Interactive CD (100%). Most students agree that the pictures used are appropriate to the topic (99%), combination of text, picture, video and animation reinforce student understanding (99%), attractive screen design (92.2%) and students can use CD Interactive without teacher assistance (95.1%).

Table 4- Beta Testing Results for Teaching Presentation Aspects

No.	Item	Frequency and Percentage (%)				%	Stage
		SD	D	A	SA		
12	Attractive screen design	0	8 7.8	20 19.4	75 72.8	92.2	High
13	Images used in conjunction with topics	0	1 1.0	13 12.6	89 86.4	99.0	High
14	The videos used make it easier for students to understand the process of releasing fish	0	0	21 20.4	82 79.6	100.00	High
15	The combination of text, images, video and animation confirms student understanding	0	1 1.0	45 43.7	57 55.3	99.00	High
16	User guides can help students explore the Interactive CD	0	4	44 59	42.7 57.3	100	High
17	Students can use Interactive CDs without the help of teachers	0	5 4.	43 55	41.7 53.4 9	95.1	High
				Average Percentage		97.43	High

3.2.4 Interactive CD Usability Level from Interaction Aspect

Table 5 shows that almost all respondents agree that the level of usability in terms of interaction is high (99.6%). 5 items were analysed in terms of interaction that shown in Table 5. Most students agree that this Interactive CD allows students to exit at any time (99%) and have smooth traveling content (99%). Respondents also agree that students can control learning according to the desired topic (98%). However, 5 students disagree with the item that allows students to restart where they left off. However, items that students can change the title of the study at any time indicate a high percentage (95.1%).

Table 5- Beta Test Results for Interaction Aspects

No.	Item	Frequency and Percentage (%)				%	Stage
		SD	D	A	SA		
18	Students control learning according to the desired topic	0	2 1.9	30 29.1	71 68.9	98.0	High
19	Smooth traveling content	0	1 1.0	20 19.4	82 79.6	99.0	High
20	Students change learning titles at any time	1 1.0	4 3.9	30 29.1	68 66.0	95.1	High
21	Interactive CDs allow students to exit at any time	1 1.0	0	26 25.2	76 73.8	99.0	High
22	This Interactive CD allows students to restart where they left off.	0	5 4.9	15 14.6	83 80.6	95.2	High
				Average Percentage		99.6	High

4. Findings and Discussions

Interactive CDs utilized the ADDIE model through tutorial learning strategy approaches and the application of cognitive theory, behaviorism and constructivism in the design and development process. The discussion of this paper focus on the functionality and usability of Interactive CD.

The developed Interactive CD has fulfilled functionality criteria when receiving feedback from six field and media experts. This feedback is supported by the findings from the questionnaires conducted on 103 students who stated that the content and teaching strategies presented in the Interactive CD are in line with the degree of usability. On the other hand, the feedback from three media experts confirmed that this Interactive CD has met the criteria of a multimedia software from technical aspects. This finding is supported by the evaluation of the students through a questionnaire conducted on the aspect of teaching and interaction. The findings of the questionnaire found that the level of interactive CD usability was at a high percentage level.

However, there are some improvements that still need to be made based on feedback given by the experts. For example, the need to provide more training in problem-solving to reinforce the understanding of student concepts. Additionally, the content in interactive CDs should be detailed or adjusted to lowered language so that the contents presented are easy for students to receive as well as students can relate to their existing knowledge. In this way, the acceptance of knowledge can be more effective when students can relate to existing knowledge. Beside that the navigational arrangements need to be added to the numerous sub-topic slides. Media experts also suggest to create a link button at the beginning of a slide that contains substantial subtopics so that students are not bored while browsing the Interactive CD. Additionally, minimal animation movements need to be improved in Interactive CDs so as to maintain the motivation of students not to be bored quickly

Based on the findings, the level of interactive CD usability in terms of suitability of the content is high. According to the study by Mohammed Yusoff et al., (2014), which states the contents of the contents of the Bodywork software is at a high level of min.

This shows that interactive CD can be suit for any contents while meet the syllabus. It also shown that students agree on the contents of the Interactive CD to be clearly communicated and to facilitate student understanding of the theory and practice of the topic. Integration of multimedia elements such as text, video, audio and animation is seen as helping to improve students' understanding. According to Mohamed Yusoff et al., (2014), to enable students to learn actively during teaching and learning, teachers need to incorporate multimedia elements and interactivity in Interactive CD software to overcome the problems of bored students and not interested in the lessons. This finding is in line with Mahmood & Noor (2011) study which states that one of the ways to improve student understanding is with the use of Interactive CD software. This is because, many students' senses can be activated through multimedia elements in Interactive CD software to enhance student understanding in teaching and learning.

Beside that students also agree the tutorial learning strategies used in the Interactive CD make it easy for students to know the learning objectives which they need to achieve through the quizzes and activities provided in the Interactive CD. Based on the findings of the study, the use of the tutorial strategy in accordance with the topics studied is at a high level. This strategy begins with the presentation of information given to students based on the examples and ends with questions or quizzes. Therefore, it gives students the opportunity to use the Interactive CD according to their own ability (Simonson and Thompson, 1997).

Learning objectives also importance in any module. This is because the objectives written by the syllabus are able to make the content in the Interactive CD software suitable for learning. A study conducted by Wan Ghazali (2001) found that 35% of respondents said they strongly agreed and 65% agreed that the web built into curriculum content was the right material for teaching. This is because the software will be more attractive, focused, structured and timely (Mohamed Yusoff, 2014). High degree of usability is also derived from the preparation of quizzes to solidify students with the topics learned, easy to understand with the content of KBAR-shaped lessons and quizzes giving early exposure to students. Quizzes, activities, exercises or self-test used in a piece of software are able to strengthen the mastery of the students while learning according to their own level of ability. This is supported by a study conducted by Saniron (2007) which shows that 76.8% of respondents have very effective opinions and 21.5% respondents agree on the usability of the K-quiz system against the developed module. Therefore, strategy that had been implement in this interactive CD are very importance to make sure student are interested to learn and give attraction to student to learn.

Based on the findings, the level of teaching presentation for this Interactive CD is high. This shows that students agree on the teaching presentations available on this Interactive CD as they apply. This is because with proper video selection with the contents of the lesson it can give a positive impact to the students. In this way, students can see and relate the material from a new perspective while improving their understanding. It also supports by Baharudin et al., (2014), showing high mean readings (4.33) on the use of video that is accurate and relevant to the content of the software to help students' understanding is high.

User guides used in this Interactive CD software also show a high level of usability. User guides are provided to help students navigate the Interactive CD. A clear user guide can help students not get lost when surfing the Interactive CD software (Mohamed Yusoff et al., 2014). Additionally, affirmative images with topics and combinations of text, images, video and animation reinforce student understanding are also at high levels of usability. This is because with the proper picture and a combination of multimedia elements such as text, pictures, video and good animation helps

students to easily understand Interactive CD content as well as a more fun learning environment. It is support by Mohamed Yusoff et al., (2014), indicating that real image and support by multimedia elements help the user to more understand the topic.

Most students agree that the course content is smooth and can control learning according to the topic they want. This statement is supported by Mukhari & Naharuddin (2011), state that all students can control the speed of learning and interactive multimedia software which is easy for students to get information. Similar findings were obtained from Baharudin et al., (2014) study, stated that 83.3% of respondents opted to agree and 16.7% of respondents opted to agree that Malay webmaster's interactive multimedia software can control their presentation of information and information in non-sequential software. This show that interaction aspect is very importance to user to give flexibility to start and to leave at any time (Mohamed Yusoff et al., 2014, Baharudin et al., 2014).

5. Conclusion

Based on this research, it shows that the design and development of Interactive CD are successful because of the process that had been through ADDIE model. The detail step that had been used by ADDIE model help the researcher to identify and apply some of multimedia elements that suitable for this syllabus. Therefore, it is importance to make sure any design and development teaching and learning aid must go through a model like ADDIE to make sure, all the criteria must be complete. It also shows that ADDIE model are suitable to any design and development of multimedia courseware.

The creation of this Interactive CD, it is hoped that it will be the driving force for the development of teaching aids which is more extensive and better meet market demand which requires interactive teaching material to align with the education world leading to PAK-21. In this way, teachers can diversify teaching techniques to choose an appropriate way of giving or enhancing the students' understanding of each topic taught especially for RBT subjects. In addition, this Interactive CD is also a form of teaching aids that is facilitative in delivering knowledge covering all the information that conforms to the content of the curriculum for RBT subjects. This is because it contains all the teaching processes that have an interesting, focused, structured and timely impact. Indirectly, the use of this Interactive CD will stimulate the students' interest in mastering knowledge according to the learning methods.

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