

# The Development of Questionnaire Instruments Assisted by Google Form Application to Measure Students' Cep Characters on The Stem Integrated Chemistry Module

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**Abstract**---The advanced technology must be used properly to support other fields, one of them is education field. One of the technological advances that can be used is *google form* application. The purpose of this study was to develop a questionnaire instrument assisted by *google form* application to measure the students' *chemoentrepreneurship* (CEP) characters on the integrated chemistry of *Science, Technology, Engineering, and Mathematics* (STEM) module. The research methods used in this study were interview and field survey. The Likert scale was used to measure the questionnaire instrument scale. The Likert scale answers to the questionnaire instrument on this research were strongly agree, agree, quite agree, and disagree. The form of the questionnaire was in a *check list* followed by the respondent's reasons for choosing the score. The questionnaire instrument drafting used a table grid which contains indicators, item numbers, and total items. The CEP character indicators that was used as a basis for the development on this questionnaire instrument were: self-confidence; results oriented; dare to take risk; leadership; creative and innovative; and future-oriented. These indicators were used as a basis to formulate statement items in a questionnaire, then used as an instrument to measure the students' CEP character. These statement items were instrument concept that must go through a validation process. The first validation stage was validation through expert examination or through a panel to review the instrument items, then it was proceed with a revision or improvement stage based on expert advice. The expert' suggestions on this questionnaire instrument development were: 1) the researcher must focus on this research 2) the statement items arrangement must be suitable with the CEP character indicators 3) the statements items arrangement have to use simple, clear language, does not contain multiple interpretations, brief, and communicative. After being revised, the questionnaire were distributed and produce a good result, including 4 respondents who obtained good scores, and 6 other respondents with very good scores. Therefore, this questionnaire can be used by public to

measure the students' CEP character on the STEM integrated chemistry module.

**Keywords:** questionnaire, chemoentrepreneurship, google form

## I. PREFACE

The advanced technology and time progress from time to time forces another life aspects to participate in rapid development. This surely without some reason, the advanced technology has many positive impacts and convenience for its users. One of which is in education field, there are many specially created applications to support education, or applications that have been available and can be used by educators. One of the applications that is often used in education field is google form.

Google form is part of google drive. Google Form or in Indonesian called formulir google is an useful application to help events planning, send surveys, give quizzes, or collect information in brief, easy and efficient. Google form can also be used to conduct surveys assisted by questionnaire instruments. By using Google form, the survey form filling becomes faster, easier, and can be accessed by anyone without having face to face.

Learning can be carried out well if there are supporting facilities. Besides textbooks, knowledge or reading sources could actually be found on the internet but the credibility is doubtful because everyone could have their own opinion. One of the solutions that can be used by educators to solve learning resource problems other than textbooks is modules.

Modules are printed teaching materials which designed to be independently studied by students. Modules also can be called as an independent learning media since they are equipped with instructions for self-study. It means that the

students could perform learning activities without teacher presence (Syamsudin, 2005: 168). One of the subjects that utilizes modules is chemistry.

Chemistry is the study of theory and energy, and the interactions between those (Purba, 2003: 2). Chemistry is important to be learned because it actually affects all the human life aspects and provides many benefits. However, the facts show that the chemistry seemed difficult for the student to understand and the students are not interested with it. It's because this subjects filled with formulas and symbols, making it difficult for students to understand without further understanding. To solve this problem, the STEM approach method is used (Science, Technology, Engineering and Mathematics) approach (Aninda, 2019).

STEM (Science, Technology, Engineering and Mathematics) is a four-aspect approach to solve real problems and also for problem-based learning. This approach is able to create an active learning atmosphere because these four aspects are highly needed in solving problems (Apri, 2015). The STEM learning approach implementation can teach a number of problems for students.

Four aspects of STEM are elaborated by Torlakson (2014), which are: (a) Science, the study of nature, which represents natural laws related to physics, chemistry, and biology and treatment or application of facts, principles, concepts and convections related to disciplines. (b) Technology, is a skill or a system that is used to organize society, organization, knowledge or it can be defined as a science and technique essence product. (c) Engineering, is a knowledge by using science and mathematics concepts as well as technological tools to solve problem. (d) Mathematic, is a knowledge that connects magnitude, space, and numbers that require logical arguments. Those four aspects can create more meaningful knowledge if it can be integrated in the learning process.

In addition to the STEM learning approach, the the chemo-entrepreneurship (CEP) approach implementation is also very much needed in learning. The concept of the chemoentrepreneurship (CEP) is a chemistry learning approach that is associated with real objects, beside to educate, the CEP approach allows students to learn material processing into an useful product, high economic value and develop students' entrepreneurial passion (Supartono, 2009). With this approach, chemistry lessons could be fun and give more opportunity for students to optimize their potency to make a product. If students get used to such learning conditions, it is possible that they will be motivated to become entrepreneurs (Mulyasa, 2004).

This means that with the CEP approach in learning, students will understand chemistry subject in real terms. Because in the learning process, the theories which given to students are associated to everyday life events either through practicum

inauguration which contain life skills or formal discussions that can trigger students' thinking capability. The chemoentrepreneurship (CEP) approach is one of contextual teaching and learning that helps teachers linking the learning material with real situations and encourages students to make correlation between their knowledge and everyday life implementation (Dewi, ER. S., Parsetiyo, and Artharina, PA, 2010).

Character is a one's behavior pattern (Ryan and Bohlin, 1999: 6). People with good character will have a kindness understanding, appreciate it, and perform it. People whose behavior is convenient to moral principles are called noble characters. Character is congenital, heart, soul, personality, character, behavior, personality, nature, mettle, temperament, and disposition. According to Bird (1988), CEP character can be stated as a state of mind which directs and guides individual actions to develop and implement new effort or create new values of existing. This character is formed by individual different factors such as needs, desire, values, habits, and beliefs.

Character assessment is crucial and complex stage. This is related to the result of character education which in the form of moral action. The results of character education are not only thoughts or movements which can be assessed easily through giving answer ability, or demonstrate a skill which is then accumulated in numbers form. Character assessment is related to the students' behavior in every activity both in school and home. One of the ways to know character assessment is through measurement.

Measurement is a degree determination process or how much of the characteristics an individual has (Shute and Becker, 2010: 5-7). Measurement is a process to measure, compare, it can be characteristics, mettle or students' ability on the basis of certain measures. Measuring is intended to provide a quantitative characteristic form or student's ability in the form of numbers. Succinctly, measurement is an activity to obtain information or data quantitatively.

Even though the CEP character is one of the most important elements in the STEM integrated chemistry module that teachers must pay attention to, they seem difficult in measuring their students' CEP character. Therefore, it is necessary to develop a questionnaire instrument assisted by google form that can be used by teachers to measure their students' CEP character.

## II. METHOD

According to Sugiyono (2014: 2) research method is a scientific way to get data with specific purposes and uses. The research methods used in this study were interviews and field surveys. According to Esterberg in Sugiyono (2015: 72) an interview is a

meeting conducted by two people to exchange information and an idea by question and answer, so it can be reduced to a conclusion or meaning in particular topic, while a field survey according to Sugiyono (2014: 7) is a research which conducted on large and small populations, but the studied data is data samples taken from the population, so that relative incidents, distributions, and relationships between sociological and psychological variables are found.

The Likert measurement scale was used in this questionnaire instrument. According to Sugiyono (2014: 132) "Likert scale is a scale to measure attitudes, opinions and people or group perceptions about social phenomena." The Likert scale answers to this questionnaire instrument were strongly agree, agree, quite agree, and disagree. The questionnaire was in the form of check list followed by respondent' reason for choosing the score. The questionnaire instrument drafting used a table grid containing indicators, item numbers, and total items.

The CEP character indicators that were used as a basis for the development on this questionnaire instrument were: self-confidence; results oriented; dare to take risk; leadership; creative and innovative; and future-oriented. These indicators were used as a basis to formulate statement items in a questionnaire, then used as an instrument to measure the students' CEP character. These statement items were instrument concept that must go through a validation process. The first validation stage was validation through expert examination or through a panel to review the instrument items, then it was proceed with a revision or improvement stage based on expert advice.

From various methods that can be used to measure the CEP character in developing the instruments, the researcher chose the questionnaire method. Therefore, the researcher must formulate the questionnaire statement points. There were several considerations for choosing questionnaire as data collection method, such as: (1) being able to collect data from a large number of subjects simultaneously compared to observation and interview methods; (2) the collected data was more objective than using interviews because respondents could respond freely, without being influenced by the mental attitude of correlation between the researcher and the research subject, or by the time availability to think about the answers; (3) could extract information related to cognitive and affective processes, which was not possible to obtain through observation; and (4) the collected data was easier to be analyzed, because the

written statements in the questionnaire were permanent and similar between submitted data to one respondent, and other respondents.

**CHEMOENTREPRENEURSHIP CHARACTER (CEP)**

The experts stated entrepreneurial characteristics with different concepts. Geoffrey G. Meredith (1996: 5-6), for instance, he stated the characteristics and nature of entrepreneurship. The entrepreneurship character is described in Table 3.1.

**Table 3.1** Entrepreneurial Character

Characteristics	Character
Confident and optimistic	Having a strong self-confidence, does not depend on others and individualistic.
Task and results oriented	Achievement needs, profit oriented, strong encouragement, energetic, diligent and steadfast, determined to work hard, and initiative.
Dare to take risks & challenge	Be able to take reasonable risks.
enthusiasts	
Leadership	Spirited leadership, adaptable to other people, and accepting critics and suggestions.
Originality	Innovative, creative and flexible.
Future oriented	Having vision and perspective toward future.

Source: Geoffrey G. Meeredith. *Entrepreneurship: Theory and Practice Ed. 5*, page. 5-6

**INSTRUMENT GRID**

The students' CEP character indicators were arranged based on entrepreneurial characteristics according to Suryana (2013: 22) as follows:

**Table 3.2** Students' CEP character indicators

Variable	Indicator	Statement Number	Number of Statements
Entrepreneurial Interest	Confidence	2, 3	2
	Results Oriented	4, 7, 9	3
	Dare to take risks	5, 12	2
	Leadership	6, 10	2
	Originality (Creative/Innovative)	1, 8	2
	Future Oriented	11, 13, 14	3
<b>Total Statement</b>			<b>14</b>

Based on table 3.2, the indicators of chemistry's learning motivation had been formulated. Based on these indicators, the items of questionnaire statements were then formulated. The formulation of the questionnaire statement items could be seen in Table 3.3.

**Table 3.3** Items of CEP Character Questionnaire Statement

Indicator	Statement Item
Confidence	<ul style="list-style-type: none"> <li>I believe that entrepreneurship in chemistry on turning plastic waste into petroleum fuel could increase my life success.</li> <li>The presence of petroleum learning in chemistry, I tried to work hard and confident in entrepreneurship</li> </ul>
Results Oriented	<ul style="list-style-type: none"> <li>Making petroleum fuel from plastic waste made me more resilient and determined in doing business and working</li> <li>I would like to correct my mistakes constantly in making petroleum fuel from plastic waste experiment.</li> <li>I kept trying and never gave up, even though the results of my fuel product failed on experiment</li> </ul>
Dare to take risks	<ul style="list-style-type: none"> <li>Making petroleum fuel from plastic waste made me dare to take risks when doing practicum even though I experienced a failure</li> <li>I would like to accept criticism and suggestions from others for my product advancement.</li> </ul>
Leadership	<ul style="list-style-type: none"> <li>Making petroleum fuel from plastic waste made me an honest and responsible person in conducting experiments</li> <li>Learning entrepreneurship was the first step to develop leadership spirit.</li> </ul>
Originality (Creative / Innovative)	<ul style="list-style-type: none"> <li>Petroleum learning which was linked to science and technology made me creative in turning plastic waste into fuel</li> <li>Petroleum learning which was linked to science and technology made me think innovative in arranging experiments to make fuel from plastic waste</li> </ul>
Future Oriented	<ul style="list-style-type: none"> <li>Making petroleum fuel from plastic waste made me adapt to the environment and other people</li> <li>Making petroleum fuel from plastic waste made me more appreciate time and process</li> <li>Creating petroleum fuel from plastic waste would make me a successful person in the future</li> </ul>

The statement items that had been arranged based on the CEP character were then used to develop the instrument of students' CEP characters measurement.

### III. DISCUSSION

There are several previous studies on topics similar to this research, for instance research by Desy Rachmawati et al (2017), entitled "The Development of Basic Chemical Modules based on STEM Problem Based Learning on Reaction Rate Material for Chemistry Education Students". It could be seen from the research title, it aimed to produce basic chemical modules based on STEM Problem Based Learning on reaction rate material which was valid and practical. The development model used in this research was the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) which is modified by the Tessmer formative evaluation method. The results of this study showed that at the expert review stage, the material expert score was 1, the design expert score was 0.65 and the pedagogic expert score was 0.64. The module validity was obtained by an average score of 0.76 from the experts, and it was

categorized as proper or valid. Based on the one to one and small group trials, an average score of 0.85 and 0.82 were obtained, which means that it was very practical. Therefore it can be concluded that the Desy Rachmawati et al' research is proven valid and practical by using ADDIE model which is modified by the Tessmer formative evaluation method.

Another relevant research is that the Hamdan Husein Batubara (2016) research entitled "The Use of Google Forms as an Assessment Tool for Lecturer performance in Uniska PGMI Study Program Muhammad Arsyad Al Banjari". This study aimed to find out the procedure of making online questionnaires using google form as a media for assessing lecturer performance and student responses toward the implementation. The method used in this research was the analytical descriptive method with data collection techniques were in the form of questionnaires and documentation study. The results of this study indicated that the questionnaire development procedure for lecturer performance in the learning process by using google form began with planning stage, creating, publish and giving instructions of use, up to one conclusion in the form of Google Form which is useful for lecturer and students to collect the lecturer performance data.

One previous research that studied CEP was entitled "The Influence of Chemoentrepreneurship (CEP) Application Approach on Students' Attitudes on Chemistry Subject and Entrepreneurial Interests" by Rahmawanna et al (2016). The study aimed to find out the increase on student attitudes toward chemistry lessons and entrepreneurial interest, and to assess the learning activities quality by using CEP approach. The method used in this research was pre-experimental design method through one group pretest-posttest design in one class. The result of Rahmawanna et al (2016) research shows that CEP learning approach implementation can increase students' positive attitudes towards chemistry lessons and increase students' entrepreneurial interest. This research surely can be a reference for researchers to finish a study entitled "The Development of Questionnaire Instrument Assisted by Google Form Application to Measure Students' CEP Character on the STEM Integrated Chemistry Module.

### IV. EXPERT VALIDATION

This expert validation aims to find out the validation level of the CEP character questionnaire. The results of expert validation can determine whether the questionnaire can be used or not. The experts who examine this questionnaire were the supervisors or lecturers who are experts in this field, they were Prof. Dr. Sudarmin, M.Si; Dra. Woro Sumarni, M.Si; Drs. Sigit Priatmoko, M.Si; Dr. Sri Wardani, M.Si.

The validators are selected based on their expertise and academic background. The first

validator was Prof. Dr. Sudarmin, M.Si, is a lecturer with ethno science expertise, therefore it is convenient with this research because STEM is still included in ethno science field. The second validator was Dra. Woro Sumarni, M.Si, she is a CEP field lecturer, because her expertise is suitable with this research, the researcher hopes that her assessment could be a benchmark. The third validator was Drs. Sigit Priatmoko, M.Si, is an expert in chemistry project, the researcher hopes that this research can be a new innovation in chemistry. The fourth validator was Dr. Sri Wardani, M.Sc., an expert in research methods, with her availability as a validator, the researcher hopes that this study can be good and useful.

Before the questionnaire instrument was used for conducting research, the validators who had been selected did expert validation. The purpose of expert validation is that the questionnaire which will be used is in accordance with scientific standards, correct, and right on target. The students' CEP character questionnaire through experts' validation and revision produced 14 students' CEP character indicators in total. The result recapitulation of questionnaire instrument validation is presented in Table 3.4.

**Table 3.4** Recapitulation of Questionnaire Instrument Validation Results

No	Validator	The questionnaire validation average value
1.	Validator 1	3.75
2.	Validator 2	3.90
3.	Validator 3	3.83
4.	Validator 4	3.90
	Average	3,82
	Criteria	Very valid

Based on the validator or expert assessment on the questionnaire, the average score result was 3.825, categorized as very good and very valid. Based on the validators' assessment result, this questionnaire gain recommendation and could be used through revisions. If it has been corrected, the questionnaire is ready to be distributed as a solution for student character problem, especially in chemistry CEP learning with STEM integrated approach. Furthermore, table of notes and follow-up by validators will be presented.

**Table 3.5** Validator Notes toward questionnaire instrument

Instrument	Input validator	Follow-up
Questionnaire	<ol style="list-style-type: none"> <li>The statement had not been focused on the research topic yet</li> <li>The statement had not been focused on indicators of CEP character yet</li> <li>Statement had not been associated with product manufacture yet</li> <li>The sentence in the statement item was too wordy</li> <li>The rating scale should not be 5</li> <li>Followed by respondents' reason for choosing the score</li> <li>Could not distinguish the difference of Likert scale answers</li> <li>Improve writing</li> </ol>	<ol style="list-style-type: none"> <li>Had been focused on research topics</li> <li>Had been focused on indicators of CEP character</li> <li>Had been focused on product manufacture</li> <li>The sentence in the statement item was corrected</li> <li>The rating scale was fixed to 4</li> <li>The respondents' reason column had been added</li> <li>Likert scale answer improved</li> <li>Improved writing</li> </ol>

After the questionnaire being revised based on experts' suggestion, the questionnaire is distributed to students via google form. The google form application usage make it easier for students to access and researchers in recapping data. Moreover, the latest situation shows that teaching and learning activities are still online due to Covid-19 pandemic for unspecified time, whereas teachers or educators have to monitor students' academic, affective, psychomotor, and their character. With this research, there is no particular reason to assess student character because it can be implemented through the google form application.

**Tabel 3.6** Questionnaire Distribution to 10 Respondents Result

Respondent Number	Score	Criteria
R-1	52	Very Good
R-2	47	Good
R-3	45	Good
R-4	55	Very Good
R-5	49	Very Good
R-6	45	Good
R-7	54	Very Good
R-8	44	Good
R-9	52	Very Good
R-10	53	Very Good

Based on the questionnaire distribution result above, 4 respondents gain good results, while 6 other respondents gain very good result. The results proves that the students' character on the STEM integrated chemistry module is in very good category and convenient with CEP character indicators.

## V. CONCLUSION

Based on the research background, methods, data analysis, and obtained validation, it can be concluded that the development of questionnaire instrument assisted by Google Form application to measure students' CEP characters on the STEM-integrated chemistry module is in very good category, therefore it can be distributed and practiced immediately after being revised by experts' suggestion.

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