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START Approach: Its Acceptability, Mobile App and Future in Biology Education Research

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Abstract

Writing a research title is structurally simple, but generating a research topic to write a title remains a practically challenging step. How do we teach students to generate research topics, then? This study introduces an innovative and novel tool in teaching topic formulation known as the START Approach, (See-Think-Aim-Refine-Tell). Employing a multiphase iterative procedure, the paper offers an improved exposition of this approach, subsequently assessing its acceptability among end-users. The collective feedback and perceptions of end-users inform the development of the START Mobile App. After pilot testing, the mobile app was officially launched, with data analysis informing its final feature set. Commencing in 2019, the START Approach was gradually introduced in various educational institutions and was ultimately launched in 2022. It was subsequently incorporated into the training curriculum for high school faculty members. The study's results demonstrated the feasibility and practicality of the START Approach, making it a promising tool for use in high school and undergraduate research courses. The high level of acceptance of the approach's features suggests that it is prepared for implementation in its current state. As a result, sustainability measures for its incorporation into biology instruction were proposed, including integration into science and research curricula, potential collaboration between secondary and higher education, and its ability to counteract the use of AI-generated research topics.

Keywords: Andragogy, Higher Education, Non-AI Tool, Research, Topic Formulation, START Approach

INTRODUCTION

The use of START Approach is believed to promote empirical mindset among beginning researchers while ensuring the contextualization and localization of topics as their possible area of research interest. During the early development of this approach in 2018 (Camara, 2019), the goal was to provide a ready-to-use template for teachers in the teaching of senior high school research in the Philippines to guide their research students in identifying an area of research which they would like to study about in a timely and efficient way.

The use of the START Approach since 2018 has gone a long way. It was first introduced in a national high school in Mangaldan, Pangasinan in 2018. By 2019, a national research organization in the Philippines included it as part of its regional and national trainings for teachers. By 2020, the approach was presented in an international research conference. It was in the year 2021 when the use of START Approach was integrated as part of instructional approaches in two graduate schools in the Philippines. During this four-year journey of the approach, the template has not been modified nor was it assessed for its applicability among beginning researchers who were actually the target users of the template. Perceptions about the usefulness of a particular technology is an important predictor of the technology acceptance and its subsequent adoption in instructional context (as qtd Akhigbe, 2021, from Celik & Yusi-

Iyurt, 2013; Chen & Huang, 2010). Largely, data on START Approach include filled out templates during class instruction or merely part of a program which did not consider evaluating the acceptability of the approach to the audience. The last publication about this approach was in 2019 which employed content analysis on forty-eight coded START templates or CST.

The Existing Practices on Research Topic Generation

The extant body of literature pertaining to the domain of research topic formulation is notably robust. Nonetheless, it consistently underscores a singular, pivotal tenet: the paramount significance of interest as a foundational element in the process of topic delineation. Online repositories associated with a myriad of universities globally employ diverse methodologies when guiding students in the selection of research topics. Purdue University, for instance, offers two distinct approaches: firstly, instructors furnish students with a predetermined roster of topics from which they may make a selection; alternatively, instructors supply an assignment sheet comprehensively outlining the logistical components of a research paper, thereby affording students the latitude to determine their research focus. Massachusetts Institute of Technology (MIT) advocates for the intrinsic value of student interest in topic selection, underscoring the premise that students exhibit greater engagement and relevance when they align their research pursuits with areas of personal passion. This cognate perspective is endorsed by Centre College, which prominently underscores the directive that during topic generation, students are engaged in an investigative endeavor and should thus abstain from preemptively asserting conclusions they intend to substantiate, thereby avoiding the protracted quest for corroborative evidence. Similarly, Emory Libraries acknowledges the primacy of interest as the genesis of the research journey, while simultaneously underscoring the critical import of diligently defining the scope for the attainment of a rigorously effective research paper.

While this paper will not argue whether interest is the first step for an effective topic generation or not, the researcher wants to offer a new idea that topic generation among beginning researchers could begin with identifying what they ‘see’ rather than what their ‘interests’ are. To start with ‘see’ and not with ‘interest’ could be seen in the pragmatic philosophy of Dewey. In 1938, Dewey was arguing on the proposition ‘Should schooling be based on Social Experiences?’ He sounded a note of caution to progressive educators who may have abandoned too completely the traditional disciplines in their attempt to link schooling with the needs and interests of the learners (Noll, 2005). This belief is not part of Dewey’s philosophy on Pragmatism. McDermid (2006), in a peer-reviewed article in the Internet Encyclopedia of Philosophy, defined pragmatism as a philosophical movement that includes those who claim that an ideology or proposition is true if it works satisfactorily, that the

meaning of a proposition is to be found in the practical consequences of accepting it, and that unpractical ideas are to be rejected.

Another philosophy that implies importance of 'see' is the Baconian Method. The Baconian Method is a methodical observation of facts as a means of studying and interpreting natural phenomena, developed by Francis Bacon in 1620 in the book Novum Organum as a scientific substitute for the prevailing systems of thought during his time which to him relied too often on fanciful guessing and the mere citing of authorities to establish truths of science. Based on the Baconian Method, the first step of any human activity, is the description of facts, which implies that we start working with what we have and know during the time of the activity.

Finally, in the book of Fraenkel and Wallen (2007) entitled 'How to Design and Evaluate Research in Education', they espoused five ways of knowing, namely (1) sensory experience, (2) agreement with others, (3) expert opinion, (4) logic, and (5) the scientific method. This listing of Fraenkel and Wallen, Bacon's belief on description of facts, Dewey's argument on practical methods are the beliefs of the researcher to put innovation in the field of research topic generation and start abandoning the 'start with interest' idea.

This study aims to explore on how the START Approach works in instruction. Further, this reported on the level of acceptability of the approach to end users, as well as an overview on the development of its mobile app version. To provide a clear perspective on how the START approach was used for sustainability in biology education, the researcher excerpted a 3-year journey of the approach among high schools in the Philippines that adopted the approach in their curriculum.

METHOD

This study utilized multiphase iterative mixed method design (i.e. moving back and forth among qualitative and quantitative methods in multiple phases with each phase consisting of new body of data which could be utilized in subsequent phases). In this study, the researcher developed an enhanced collective description (ECD) from 2019 to 2020 on the application of his START Approach by various stakeholders and provided a refined step-by-step guide on how such an approach is done. This ECD was presented to potential end users of the approach in a webinar in November 2021 who identified the level of acceptability of the approach along pre-identified areas or indicators. Then, both the ECD by the researcher of the approach as well as the acceptability values from the end users were analyzed and later used as basis in developing a mobile app version of the approach.

The mobile app was first developed in March 2022, it was pre-tested in a focus group discussion in April 2022, which further refined the mobile app's features, and was later

launched in adopted schools in June 2022. Furthermore, in September to December 2022 it was utilized in classroom instruction by adopted schools in the Province of Pangasinan, Philippines. Finally, in October 2023, it was adopted as a Training Topic for science and researcher educators in an integrated school in Dagupan City, Philippines. Further, in October 2023, an extension monitoring was conducted to assess the implementation of the START Approach in a research-inclined school in Pangasinan, Philippines.

For this article, five areas will be reported: [1] Enhanced Collective Description in applying START Approach for Classroom (Biology) Instruction, [2] Perception of End Users [3] Point of Agreement of Features, [4] Flowchart of the Mobile App, and [5] Sustainability Measures in Biology Education.

RESULTS AND DISCUSSIONS

How do we apply the START Approach in Classroom [Biology] instruction?

Table 1. The Enhanced Collaborative Description (ECD) of the START Approach

Step	ECD by Camara, 2023	How to apply the step as a teacher
See: Looking [1 min]	Using human senses and tools to 'see' an object in the immediate environment. (Note: The use of 'tools' as an aid to the human eye is used when the class is an advance class in 'Under Cell Biology'	Accompany STEM students in an environment where their strand most fits in (i.e. any science laboratory, garden, fieldwork, etc.) Guide question: Class, look around you. What do you see? Loos at one object without the need to reason out why you're looking at it.
Think: Outlining [2 mins]	Mentally outlining around 3-4 'under the sun' (UTS) things that come to mind while looking at the SEEn object (i.e. clearer focus on size, shape, color, location, imprints, personal experience, and any of the object's attributes)	Task: Mentally list some physical characteristics of the object or anything that come to mind while focusing clearly on the objective. List at least 3. (Note: The use of at least 3 trains the mind to not think of only one to promote diversity. However, once one is chosen, others will be discarded.)
Aim: Focusing [3 mins]	Choosing only one among the OUTLINEd UTS to specifically focus at, while putting others aside (i.e. intent to have closer focus based on whatever personal reasons using 'Wh' questions)	Guide question: Mentally choose one (only one) among your mental list (Note: Most likely students will remember the 1st and last on the list, and that is acceptable. Please refrain from asking the students to 'write', but train them to mentally 'outline')
Refine: Verbing [4 mins]	Using this AIMed focus, identify a verb that could specify the doable aspects. (Note: Students know verbs because they already met this in their English subjects. This is a crucial step, help your students. Many fails in this step.)	The teacher presents some verbs using Revised Bloom's Taxonomy of Objectives Guide question: Using the verbs, identify what you want to do. (Note: Most likely students will choose similar verbs and that is acceptable). The teacher requires each student to 'write' their VERBed ideas on a paper.

Step	ECD by Camara, 2023	How to apply the step as a teacher
Tell: Sharing [10 mins]	Using the VERBed focus, share what you want to 'do' (i.e. methodology) to others	The teacher opens the class for Think-Pair-Share (for classmates) and The Knowledgeable Other aka TKO (for experts)

Perceptions of End Users on START Approach's Doability

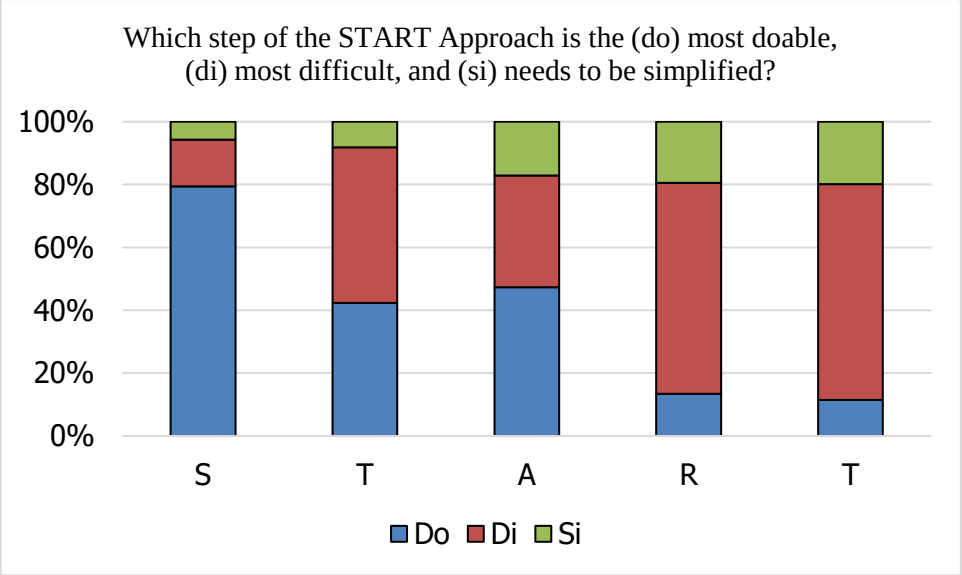

Figure 1. 100% Stacked Column comparative representation on the most doable, most difficult and needing simplification step of the START Approach

As a review, the START Approach involves five steps, in sequence, they proceed from See–Thin –Aim–Refine–Tell, with each step carefully described in Table 1 and first appeared in the article 'START Approach as Practical Tool for Beginning Researchers' (Camara, 2019). Respondents were asked which of these steps did they perceive to be the most doable and most of them answered 'See' is the most doable (55.17%) based on Figure 1. Further, most of them (34.38%) think that 'Refine' is the most difficult to do and which, in turn, they (34.38%) think need to be simplified. All of these concerns were addressed by the developer in designing the mobile app (Ventayen, 2020) for the benefit of the user.

Point of Agreement on Features of the START Approach

Table 2. Weighted Means and Descriptive Equivalent on Features

No	Point of Agreement on Potential Features	WM	SD	DE	Rank
1	The START Approach can be used by both high school and college students.	4.62	0.68	VHA	1
2	The START Approach could be integrated in teaching research subjects.	4.59	0.68	VHA	2.5
3	The START Approach is a practical tool in generating research ideas.	4.59	0.57	VHA	2.5
4	The START Approach is easy to understand	4.55	0.74	VHA	4
5	The START Approach is user-friendly.	4.52	0.74	VHA	5

No	Point of Agreement on Potential Features	WM	SD	DE	Rank
6	The START Approach is easy to follow.	4.48	0.74	VHA	6
7	The START Approach is flexible.	4.45	0.73	VHA	7.5
8	I can narrow down general topics into manageable topics using the START Approach.	4.45	0.69	VHA	7.5
9	The steps of the START Approach are doable.	4.41	0.78	VHA	9.5
10	The START Approach is a consistent way of generating topics.	4.41	0.73	VHA	9.5
11	The use of START Approach is time friendly.	4.38	0.73	VHA	11.5
12	Each step in START Approach is relevant to all the other steps.	4.38	0.73	VHA	11.5
13	I can generate a research topic in a short period of time using START Approach.	4.28	0.88	VHA	13
14	The START Approach is simple to use.	4.24	0.87	VHA	14
15	I can perform the START Approach without assistance.	3.86	0.88	VHA	15
	AVERAGE WEIGHTED MEAN	4.41	0.75	VHA	

Legend: 1.00 – 1.80 Not Agree (NA); 1.81 – 2.60 Moderately Agree (MA); 2.61 – 3.40 Agree (A); 3.41 – 4.2- Highly Agree (HA); 4.21 – 5.00 Very Highly Agree (VHA)

The participants were given a set of fifteen statements on the use of the START Approach and they were asked to rate these features from 1 to 5, with 5 as the highest level of agreement. The weighted means were calculated and ranked from highest to lowest to identify which feature is most or highly agreed upon by the participants. Results appear in Table 2.

Table 1 reports that the use of START Approach received a weighted mean of 4.41 with a standard deviation of 0.75 which is interpreted as Very Highly Agree. Further, Table 1 reveals that the participants agree very highly that the approach could be used by both high school and college students (M=4.62, SD=0.68), could be integrated in the teaching of research subjects (M=4.59, SD=0.68), a practical tool in generating research topics (M=4.59,SD=0.57), is easy to understand (M=4.55,SD=0.74), and is user-friendly (M=4.52,SD=0.74). The perception that the START Approach could be used by both high school and college in generating their research topics ranked first among all the other areas of perceptions asked from the respondents. From the time the approach was developed until this period, several published articles (Israel & Camara, 2021; Nacar & Camara, 2021; Bona & Camara, 2021) have recognized the use of the approach in generating research topics which they conducted and were eventually published in online journals as a complete package academic article, even among graduate school students. This suggests the dynamism which the approach has provided to all types of students if in research, they consider themselves as beginning researchers.

Further, participants agree very highly that the START Approach possesses the following attributes: flexible, time-friendly, doable, exhibits consistency, simple, and is easy to follow.

The idea that the ‘See’ is the most doable step has, while obviously self-explanatory, only represent more than 50% of the participants. Other participants think of other steps as most doable and the next most doable step after to ‘See’ is to ‘Think’ (20.69%). This finding implies that one-fifth of the participants are not empirical but are thinkers. They seem to be better in thinking more than using their eyes to start with. While this finding is a welcome response that they are ‘thinkers’, this could defeat the purpose of the approach which is mainly ‘empiricism’, i.e. the idea that you will base your thinking with what you see, feel, hear, taste, and touch, or simply using the human senses. This could also imply that the participants, who were K to 12 graduates, were stuck in the belief that thinking about their ‘interest’ is the first way and only way to generate a research topic.

Furthermore, the participants believe that each step is relevant with all the other steps, and they could generate a topic in a short period of time, even without much assistance from a the-knowledgeable-other. The belief that ‘the’ students could perform the approach even without assistance, while receiving a high weighted mean of 3.86 and a standard deviation of 0.88, ranked the lowest, i.e. 15th. In a nationwide study among K to 12 graduates, Rahon et al (2021) reported that students could perform several research-related tasks when they have their notes with them. This finding is very encouraging because the participants would desire either the guidance of another classmate (Camara, 2018; Camara, 2020; Bermundo, et al, 2021; Pasana, et al, 2020) which promotes collaboration or guidance from a teacher (Penuliar, et al, 2021) which promotes scaffolding (Nacar & Camara, 2021; Israel & Camara, 2021). Either way, the approach is viewed as a guide to learn and not merely a tool that is self-packaged that starts and ends in itself – another picture that the approach exhibits dynamism and, as reported in Table 2, flexibility and consistency.

FLOWCHART FOR ‘START Mobile App’

The START Mobile App basically involves a user and an evaluator. The user types his or her responses from the ‘See’ to the ‘Tell’ steps of the approach, then submits the answer. The app prompts the evaluator on the receipt of the responses and requests feedback from the evaluator. The evaluator sends feedback to the user in the app. Then, one transaction is accomplished. The app could be used by multiple users at the same time. The app was launched in June 2022 as pilot test for usability, which again provided basis in revising or enhancing the flowchart. The app is yet to undergo technology acceptance and impact assessment in June 2024.

Sustainability Measures for Biology Education

The essence of any research is that the findings will provide a developmental aspect in the society including sustainability measures. Sustainable development, as defined by UNESCO, means "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." In this context, the use of the START Approach as well as its app version will provide sustainable delivery of science and research instruction in several ways.

First is curricular integration in basic education. The approach could be integrated in the research curricula in special science classes in junior high school or even in senior high schools as a practical step-by-step guide for beginning researchers. The acceptance of the title by the teacher implies that the title developed has merit and appropriate for further scientific investigation.

Second is partnership between state universities and colleges and basic education schools in the Philippines or overseas. An enhanced collaboration between basic education schools and higher education institutions could strengthen the utilization of the approach not only in research subjects but in science subjects as well. This is because science subjects also include the writing of science investigatory projects which requires the generation of research topics. This implies that the research approach is interdisciplinary.

Third is non-AI feature. The approach includes a component of 'See' which requires that the learner writes something that he or she has seen in his or her immediate environment. This requirement of the approach disables the ability of AI to generate topics for the learners because obviously AI tools do not 'see' their environment, and they would only analyze based on written inputs fed to these tools. To see something from the environment is a limitation of AI tools including ChatGPT which makes the utilization of this approach sustainable. If an argument that sooner or later AI tools could 'see' their environment, the perception of the AI tools to its environment may not be as localized or contextualized if compared with the learners doing it because, once again, the ability of the AI tools to understand what they see is based on codes fed into it, and not based on human (i.e. the learner's) experiences with this immediate environment.

CONCLUSION

This study explored the features of the START Approach as an innovative and novel tool in generating a research topic for high school and undergraduate research students. The data suggests that these attributes are well-suited for incorporation into research curricula, catering to both STEM programs and college-level research courses. Moreover, the mobile application,

upon its market availability, holds promise as a complement to the START templates for instructional purposes within the classroom setting. The sustainability of this tool is evident in its utilization and application during training sessions with end users in adopted schools in Pangasinan, Philippines. The future of this tool in Biology research is manifested by the number of research titles, observed during training sessions, that fall under Biology. The researcher recommends that the START Approach would be enhanced based on the comments, observations, and insights from the users, trainers, and stakeholders, and from the data corpora of START outputs. Continuous utilization of this approach in other fields (i.e. Chemistry, Physics, Fisheries, Engineering) is recommended.

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