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1   **ABSTRACT.**

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3   CITI Training (Collaborative Institutional Training Initiative) provides bioethical research training for investigators

4   around the globe. We report a pilot case study on the user experience (thoughts, feelings) of completing

5   mandatory CITI Training from the perspective of a rising high-school sophomore and a medical student with

6   limited research knowledge. These experiences were compared via reflections after completing both CITI

7   Trainings. The study results highlighted the obstacles experienced by a naïve researcher while completing CITI

8   Training. We argue that CITI Training ought to make accommodations to ensure content is understandable to

9   highschool and medical students with limited research knowledge.

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1   **THE EXPERIENCE.**

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3   Completion of human subjects ethics training is mandatory for researchers. The Good Clinical

4   Practice (GCP) and Basic Human Subjects Research (HSR) Collaborative Institutional Training Initiative (CITI

5   Training) is the gold standard of human subject ethics training via completion of mandatory webinar modules

6   and is used by over 1,500 institutions globally.[1] Completion of CITI Training is an important step in a

7   researcher's training, allowing the researcher to fully comprehend the historical bioethical perspective and

8   regulatory parameters required to perform ethical research.

9   The CITI Training Program offers two formats: audio-visual and classic. The content presentation

10 differs based on several factors. The CITI Program website differentiates the formats as "largely a matter of

11 personal taste."[3] While an audio-visual option might present as more engaging to a learner, both versions still

12 have long texts. The audio-visual format does split the paper into a slideshow format, although retaining the

13 verbatim content.

14   CITI Training is targeted to institutional review board members, clinical research coordinators,

15 research staff, principal investigators, and college students.[1] Historically, inexperienced student research

16 learners including highschool, undergraduate, and/or medical students are not involved in providing feedback

17 on research ethics training.

18   Current challenges facing highschool students during the completion of CITI Training include that

19 research ethics is not part of a normal highschool curriculum in the USA and that highschool students do not

20 regularly conduct human subjects biomedical research. Current challenges medical students face when

21 completing CITI Training include the training is often viewed as an additional coursework assignment and may

22 not be given the time/attention required to deeply understand the material.

23   Prior research has investigated the experience of certified peer support specialists completing CITI

24 Training. This gives the perspective of 5 individuals completing CITI Training that are also research naïve.

25 Their results also determined comprehension difficulties.[5]

26   The purpose of the present correspondence is to convey experiences of CITI Training from the

27 perspective of a highschool student/medical student. Ensuring CITI Training is available and effective training

28 for all researchers is part of establishing researchers that are well versed in ethics training prior to engaging in

29 human research. This is important to allow a larger and more diverse group of people to safely participate in

30 the completion of human research projects. We aim to highlight the unintended and previously unassessed

31 gaps in comprehension that can occur when research-naïve students complete CITI Training.

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1 **METHODS**

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3   A pilot qualitative phenomenological research case design was used. The same student reflected on

4 the experience of CITI Training during two chronologically separated times – as a highschool sophomore in

5 North Carolina in 2017 and as a first-year medical student in Ohio in 2023. Journaling, a standardized

6 research methodology to document experiences and reactions at the time of completing both CITI Training

7 sessions was used.[3] The student received research mentorship in both time instances from the co-author

8 (MH). The key differences between the CITI training course completion dates include the first author's

9 chronological age, research exposure, and the completion of a Bachelor of Science (BS) degree in Chemical

10 Engineering.

11   The journaling process included splitting the CITI Training into 3 days. At the end of each day, the

12 student journaled their thoughts/feelings towards the sections they had completed that day. Then the student's

13 reflections were analyzed by using a structured and iterative process of developing and refining key statements

14 in the student's own words representing the students experience (thoughts/feelings) of taking the CITI Training,

15 during face-to-face dialoguing with the research mentor as well as email correspondences. This process

16 enabled open expression of opinions, dialogue, feedback and open expression of opinions and critiques of CITI

17 Training topics, while maintaining optimal communication between the student and the research mentor.

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1 **OUTCOME.**
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3   To our knowledge, this is the first project reporting the experience of completing CITI Training content
4 from the perspective of a naïve highschool and medical student researcher. The student passed their CITI
5 training courses in both instances, yet the experience and overall understanding was markedly different. They
6 received a 91% on the HSR post-test and a 100% on the GCP post-test as a highschool sophomore. Yet, they
7 felt they had not mastered the material nor felt confident in their understanding of human subject research
8 ethics.
9   Several key themes emerged when the experiences of completing CITI Training as a highschool
10 sophomore and a medical student were compared. As a naïve highschool student, the CITI Training modules
11 were found to be filled with complex vocabulary and difficult concepts. The mean readability found within
12 Human Subjects Research modules is 14.8 grade (Junior level in College).[2] The modules relied on
13 terminology that at times was felt to be above the highschool student's intellectual ability to understand the
14 material. This required extensive consultation with other resources to understand the intellectual content of
15 the modules. Mainly, they used search engines such as Google to define and explain terminology. Translating
16 the modules using other resources affected the fluency of learning and detracted from the material itself; thus,
17 changing the ability of CITI Training to convey the material effectively. The entire process was felt to be
18 tedious, confusing, and somewhat frustrating while the student attempted to understand the material. The
19 student questioned the worth of CITI Training because they did not fully understand the modules. The student
20 remarked that this detracted from the value of CITI Training and the module's ability to highlight ethical
21 considerations in research. During the module's post-test assessments, they often found themself having to
22 take the post-test multiple times in order to receive a passing score. Thus, reflecting on the fact that a passing
23 score, or high passing percentage, does not equate to comprehension of historical bioethical perspectives of
24 researching human subjects but, rather, repetitive rote memorization.
25   The student retook the CITI modules as part of their coursework during their first year of medical
26 school. This occurred 7 years after they first completed the CITI program as a highschool sophomore in 2017.
27 In between these years, they had experienced reading dense collegiate level texts, engaged in multiple
28 research projects, presented posters at national and international conferences, and received a Bachelor of
29 Science degree in chemical engineering with minors in psychology and biological sciences.
30   With their added experiences, they felt well-versed in research jargon and nomenclature.
31 Therefore, during their second completion of the CITI Training modules, they were able to
32 complete the modules faster and complete the course more efficiently. They remarked that the
33 modules "made sense". Additionally, while the materials remained tedious, the modules were
34 not confusing as compared to the user's experience completing CITI Training as a highschool sophomore.
35 Figure 1 outlines the steps the medical student took to achieve mastery of the CITI Training modules.
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1 **CONCLUSION.**

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3   Comparing these two differing research experiences, it is plausible that research-naïve individuals
4 finishing CITI Training could be unprepared for their research position. CITI Training is a global training but it is
5 not very inclusive of student learners. The gap between educational material and learned material can arise
6 from the difference in actual users versus intended users of the CITI Training Modules. Completion of CITI
7 Training allows the participant to fully comprehend the regulatory parameters required to perform ethical
8 research. External resources such as a readability tester to objectively analyze the CITI Training text and rewrite
9 the training to an 8th grade reading level could ensure all high school students would be able to successfully
10 complete CITI Training. Future consideration could include surveying the perspective of CITI Training from
11 researchers with experience. Future studies including a larger sample size should examine adjustments to the
12 CITI program including tailoring content to highschool learners; lessening unnecessarily complex vocabulary;
13 adding basic and concise concepts; integrating video webinar education to allow interactive learning; and the
14 creation of vocabulary keys.

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1 **SUMMARY - ACCELERATING TRANSLATION**

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3 This study compared two experiences from an individual when completing Collaborative Institutional Training

4 Initiative Modules (CITI Training). These modules are meant to teach and prepare researchers on basic ethical

5 conduct when completing human research. The study participant completed their first CITI Training in

6 highschool and their second CITI Training in medical school. The difference highlighted between the two

7 experiences included the difficulty of understanding the material and the overall emotional experience of

8 completing the training. The results suggested that CITI Training is experienced differently depending on an

9 individual's prior research exposure and education level. The study suggests various edits to the CITI Training

10 Modules including ensuring readability at an 8th grade level, including more basic topics, and integrating video

11 webinar.

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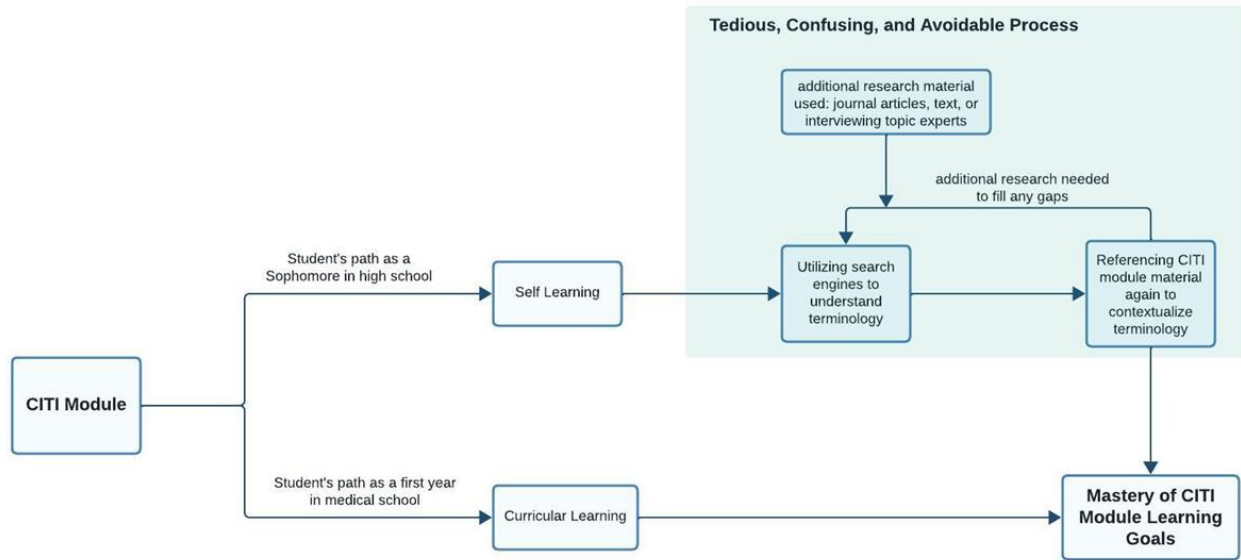
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2 **FIGURES AND TABLES.**

3 **Figure 1.** CITI Module Learning Pathways

4 **Key:**

5   CITI – Collaborative Institutional Training Initiative

6   CITI Module – Good Clinical Practice and Basic Human Subjects Research CITI Training

7   Self Learning – the process a naïve researcher takes when approaching a CITI Module

8   Curricular Learning – the process an experienced researcher takes when approaching a CITI Module