A Modified Delphi Study to Define *Ah ha* Moments in Education Settings

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Ah ha moments are often mentioned in education literature. These moments are suggested to be a powerful aspect of learning, yet limited research is present regarding this topic. Ah ha learning moments have also not been defined in the education literature, resulting in the likelihood that each educator and learner may have differing definitions. Before studies can be conducted to seek out educational strategies to promote these learning moments, a clear definition is needed. This article presents the results of a modified Delphi study aimed at seeking a consensus definition of ah ha learning moments among a group of experts from varied education settings.

An ah ha moment is defined by Merriam-Webster (2014) as "a moment of sudden realization, inspiration, insight, recognition, or comprehension." Ah ha moments have also been referred to as insight, Eureka, epiphanies, and light bulb moments. An ah ha experience can indicate understanding of information that was previously not comprehended (Chein & Weisberg, 2014; Kounios, et al., 2008; Penaluna, Coates, & Penaluna, 2010). Educators recognize ah ha moments as being an important and powerful aspect of the learning environment (Hardjito, 2010; Kowalski, 2007; Paulus, 2008; Sword, 2012). However, an extensive review of the literature demonstrated a lack of research from the education arena regarding this topic. Research is needed to explore and examine potential teaching and learning strategies that can promote ah ha learning moments. However, before delving too deeply into explorative studies, ah ha moments needed to first be defined from the education perspective. A consensus

definition can provide the framework for additional data collection and future studies.

This article includes a description of a modified Delphi study regarding ah ha learning moments. The study purpose was twofold. The first was to develop and gain consensus for a definition of ah ha learning moments by actively engaging education experts from a variety of educational settings in development of a definition. The second was to explore potential strategies that can promote ah ha learning moments by seeking insight from experts based on their prior experiences. The results of this study can inform future data collection aimed at identifying strategies to promote an increase in these moments in educational settings.

Background, Review of Literature, and Significance

Long term recall of information is needed in order for learners to apply their knowledge (Sousa, 2011; Willis, 2006). In particular, learners need to be able to apply the information they learn in a variety of settings and situations. As a result, education needs to be provided in a manner that promotes long term recall (Sousa, 2011). Research studies from the cognitive sciences suggested that ah ha moments can improve long term memory. For example, fMRI studies have indicated the amygdala (the emotion center of the brain) is actively stimulated during ah ha moments (referred to as flashes of insight) resulting in stimulation of long term memory of the episode (Dudai, 2011). Additional studies from the cognitive sciences have examined how ah ha moments are processed and stored in the brain (Chein & Weisberg, 2014; Cinan & Dogan, 2013; Dietrich & Kanso, 2010; Kounios & Beeman, 2009). Similarly, studies from the behavioral sciences have examined ah ha moments in relation to creativity, pleasure, and perceived confidence (Muth & Carbon, 2013; Topolinski & Reber, 2010; Zhong, Dijksterhuis, & Galinsky, 2008).

An in-depth review of the education literature for *ah ha l*earning moments resulted primarily in anecdotal articles. For example, many educators reported the importance of *ah ha* moments during learning (Hardjito, 2010; Kowalski, 2007; Paulus, 2008; Sword, 2012). Mavor and associates (2010) described *ah ha* or *Eureka* in the industrial training setting as the "moment whereby the logical relationship between parts of the problem become clear" to the learner (p. 838). However, the result of the literature search demonstrated limited research from the education arena. The studies that were available included reporting of *ah ha* moments as a minor portion of a larger study. For example, Tupper and associates (2013) conducted a study regarding a simulation patient safety workshop. As part of the evaluation, they asked participants to indicate if they experienced *ah ha* moments. Similarly, Wetle and associates (2008) conducted a study to evaluate medical student responses to a curriculum change. As part of the study, they reviewed personal responses from students, including *ah ha* moments. While these studies provided some insight into *ah ha* learning moments, they lacked a specific focus on the topic.

The primary purpose of the study described in this article was to explore the concept of *ah ha* moments from expert educators' viewpoints with the goal of developing a consensus definition, as well as to gain insight regarding potential educational strategies that may promote these types of learning experiences. For the purpose of this study, experts were defined as those educators who had at least 5 years teaching experience, who were actively in a teaching role with direct contact with learners (within the previous 6 months), and who had demonstrated use of effective teaching strategies (as witnessed by their peers or learners).

The research questions for the study included:

- How do expert educators define *ah ha* learning moments?

- What pedagogies have expert educators witnessed as promoting *ah ha* learning moments?

Study Design, Data Collection, and Analysis

The study design included a modified Delphi approach. The Delphi technique "is a structured process that involves collecting and synthesizing knowledge from a group of experts" (Wiersma & Jurs, 2009, p. 314). The method includes solicitation of ideas and input from individuals with diverse expertise in relation to the research topic. Components include controlled feedback, anonymous responses, and analysis of group responses. Multiple rounds of input are often needed to reach final conclusions or consensus. The Delphi technique is a spin off from a 1950's project by the RAND Corporation. Project Delphi incorporated a process using expert opinion to assist the United States military in predicting future technology needs (Dalkey & Helmer, 1963). The process has evolved over time with a variety of modifications. One of the most common modifications is the use of electronic questionnaires (as opposed to the original paper and pencil format). The study described in this article was conducted virtually using an online survey website.

The study began with IRB approval for 3 to 5 rounds of questions. Experts were sought from varied educational settings including K-12, undergraduate, graduate, faculty training, and corporate training, with the goal of gaining a holistic perspective of *ah ha* learning moments. Purposive sampling was used to invite known experts meeting the inclusion criteria (listed earlier). Snowball technique was employed to identify additional experts. The desired sample size was 6 to 18 participants, and distributed so that a limited number of experts (1 to 3) in each educational setting were included.

A total of 30 invitations were extended. Ten experts agreed to participate. The participants were from 7 different states within the United States. Expertise areas included: one expert from K-12, three from undergraduate, three from graduate level, two from faculty development, and one from corporate training. The participants from undergraduate, graduate, and faculty development included both traditional and online faculty. Experience in education ranged from seven to 38 years, and all reported current/active interaction with learners.

Once participants were identified, data collection proceeded. The first round of questions was developed based on findings from the literature. The initial questions were qualitative and exploratory in nature. Subsequent rounds became increasingly quantitative with the goal of reaching consensus. Consensus was defined as 80% agreement. A period of two weeks was allotted for participant responses for each round. Questions for the next rounds were developed based on responses to previous round. The following paragraphs provide a detailed description of each round.

Round 1

Round 1 included open-ended questions, which provided participants with the opportunity to document their general thoughts regarding ah ha moments, to propose definitions based on their experience, and to provide examples of pedagogies they had historically noted to evoke *ah ha* moments in learners. The open ended questions in round 1 included:

1. When you hear the phrase "*ah ha* moment" in relation to learning, what terms or phrases immediately come to mind?
2. Provide a brief example of when you observed a learner experiencing a *ah ha* moment (include what led you to believe an *ah ha* moment had occurred)

3. How do you personally define a *ah ha* moment?
4. Provide a list or examples of pedagogies that you have historically noted to evoke *ah ha* moments in learners.

Qualitative analysis was used to examine the responses to Round 1. The responses to the first three open ended questions were analyzed for emerging themes. The most common theme was a *new understanding* (the learner "get's it"). The next was the learner making *connections* (old knowledge to new knowledge, a new piece of information helps "connect the dots"). Another theme was associated with the *excitement* experienced by the learner (potentially leading them to want to learn more). The final readily apparent theme was *application* of the new understanding (to practice or to real life situations). Additional themes included a *change in perspective* (thinking in new ways), gaining *insight*, and *enlightenment*.

Analysis of the fourth survey question included seeking the most commonly reported pedagogies for which the participants had historically witnessed as leading to *ah ha* moments for their learners. The most frequently reported strategies included group/collaborative learning projects, use of questioning, storytelling, real life examples, analogies, and simulations. Additional strategies included problem-solving activities, use of teach-back, reflective activities, visuals and videos, theoretical application, and group discussion.

Round 2

The responses from Round 1 were used to guide question development for the next round. In round 2, participants were provided with a description of the four themes that arose from Round 1 (understanding, connections, excitement, and application). The first question for Round 2 was open ended: Taking these themes into consideration, propose a definition of *ah ha* moments that could be used as the formal definition from the education perspective. Participants were

asked to answer this initial question before proceeding to the remaining questions. The goal of doing this was to give them the opportunity to develop definitions based on the themes that arouse from the group responses. The second question included the option to select a definition from a list of 5 proposed definitions developed by the primary investigator (PI), which were developed based on both the themes that arose from Round 1, as well as based on findings from the literature review. The final question in Round 2 addressed pedagogies. Participants were notified of the identified educational strategies in Round 1. They were then given the opportunity to rank the strategies in the order that they had most commonly witnessed resulting in or leading to *ah ha* moments among their learners. Consensus was reached regarding the most commonly identified pedagogies and are provided later in the results section of this manuscript.

Round 3

Round 3 questions were devised based on the responses to Round 2. The first question included a list of all participant definitions from Round 2, as well as the most voted proposed definitions. Participants were asked to rank the top 4 definitions they believed to best define *ah ha* learning moments. The definitions gaining the highest number of responses in Round 3 included:

> *Ah ha* is a moment of understanding ("now I get it") when a learner sees a new connection not previously seen. The understanding leads to excitement, deeper comprehension, a change in perspective, and/or recognition of how it can be applied to real life situations.

> Ah ha moments are defined by the learner: having a new understanding (leaner get's it), making connection

> between old and new information (connecting the dots), participating in a new experience (potentially leading them to want to learn more), gaining insight or enlightenment, applying new information or changing their perspective.
>
> An ah ha learning experience is a moment of understanding ("now I get it") when a learner sees a new connection, a moment of sudden comprehension of previously unclear information. It is a distinct moment and often happens suddenly or all at once, and in fact leads to increased future understanding and application of concepts to more advanced problem situations.
>
> An "ah ha moment" may be defined as a moment of sudden comprehension in which a person becomes aware of the cognitive construction of new insight and perspective that clarifies and deepens understanding of concepts.
>
> An "ah ha" moment in learning is the realization by the learner that he/she gets it, that he/she is now able to connect the new to the old, and can now apply the new knowledge to real life problems.

The second question was developed based on the most commonly used terms that appeared in Round 2 proposed definitions. These terms included: understanding, connect (or connections), perspective, apply (or application), insight, comprehension, sudden (or suddenly), excitement, and enlightenment. In Round 3, participants were asked to select from this list of words and specify the ones they believed were essential to the final definition. The most commonly selected terms included *understanding, connect (or connections),* and *apply (or application).*

Round 4

Participants were provided with a detailed description of the results from Round 3 (listed above). They were asked to vote on the one that they believed best defined *ah ha* learning moments. They were also given the opportunity to provide rationale for their choice. The results for Round 4 demonstrated a majority vote for the first definition listed above. However, consensus was not reached, indicating the need for an additional round. The most commonly selected defintions from Round 4 were compiled along with participant rationale (Table 1).

Round 5

The content in Table 1 was sent to the participants, allowing them the opportunity to review the rationale provided by all participants before voting. The results of round 5 resulted in the options being narrowed to 2 choices. A majority vote was noted for the same definition as in previous rounds, yet consensus was not gained. Due to lack of consensus, a modification was requested to the original IRB application to conduct an additional 1 to 3 rounds, as needed. Once approved, participants were given the opportunity to continue with additional rounds if they were willing. All agreed to continue.

Round 6

The two remaining definitions were presented to participants in Round 6. Again, while the majority vote was consistent, consensus was not reached. Based on the recommendations by von der Gracht (2012) regarding consensus measurement in Delphi studies, an analysis of stability of answers from round to round was conducted. The majority of respondents consistently selected the same choice each time. It was not anticipated that they would change their votes in future

rounds. Three of the participants had indicated in the

Table 1: Results from Round 4 with Participant Rationale

Top 3 choices for definitions	Rationale provided by participants in Round 4
An ah ha moment is a moment of understanding ("now I get it") when a learner sees a new connection not previously seen. The understanding leads to excitement, deeper comprehension, a change in perspective, and/or recognition of how it can be applied to real life situations.	It provides a comprehensive list of both cognitive and emotional reactions. Application is not necessary during the actual learning moment (so that eliminated 2 options); awareness of cognitive construction assumes too much of the learner (so that eliminated another option); participation in new experience doesn't seem necessary for a ah ha moment (which eliminated the other option). Simply stated and understandable.
An ah ha learning experience is a moment of understanding ("now I get it") when a learner sees a new connection, a moment of sudden comprehension of previously unclear information. It is a distinct moment and often happens suddenly or all at once, and in fact leads to increased future understanding and application of concepts to more advanced problem situations.	The phrase, "moment of sudden comprehension" is the key to the ah ha moment. Provides greater clarity. This definition is comprehensive and captures the essence of that aha moment. This definition encompasses all of the key points -- a specific moment, the learner sees the connection all at once and the understanding leads to the ability to apply the concepts to future problems.
An "ah ha" moment in learning is the realization by the learner that he/she gets it, that he/she is now able to connect the new to the old, and can now apply the new knowledge to real life problems.	It is clear and simple. The definition should be as short as possible, while still explaining it well. All definitions are quite similar in meaning, but this one says it in fewer words.

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comments including:

- The word "sudden" is key
- The participant does not have to actually apply the info (in the moment)
- Excitement does not have to occur

Based on participant feedback, the most commonly voted definition was revised to address these concerns.

Round 7

In Round 7, the revised definition was presented to participants, with rationale for revising. Participants were then given the option to either vote for the new definition or continue rounds using the 2 previous definitions. The majority of participants voted for the revised definition, and consensus (90%) was reached.

Results

The purpose of this study was to seek a consensus definition of ah ha learning moments, and to gain insight into potential strategies associated with these types of learning moments. The consensus definition was:

Ah ha is a moment of sudden understanding ("now I get it") when a learner sees a new connection not previously seen. The understanding may lead to excitement, deeper comprehension, a change in perspective, and/or recognition of how it can be applied to real life situations.

The most common strategies that participants identified from their practice as historically leading to or resulting in *ah ha* moments among their learners (in order of ranking) were:

1. Real life examples
2. Questioning
3. Refection/reflective activities
4. Analogies
5. Problem solving in teams

Additional identified common strategies included simulation, stories (storytelling), visuals, and group discussion. While these strategies were based on personal experience and prior to reaching a definition of consensus, they can provide insight into potential strategies until additional studies can be performed.

Conclusion

While various definitions have been provided for the phrase *ah ha*, a specific definition of *ah ha learning moments* was lacking from the education literature. This article includes a report of a modified Delphi study aimed at developing a definition. Study participants included experts from a variety of education backgrounds ranging from K-12 to corporate training. Participants provided input during multiple rounds until consensus was reached. Having a consensus definition of *ah ha* learning moments in education provides a starting point for additional research. Future studies can focus on gaining input from learners and educators regarding actual

strategies that invoke these learning experiences. The information can then be shared with educators with the goal that they will incorporate more activities aimed at promoting *ah ha* learning experiences.

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